

CLEAN

Contract No. N62474-88-D-5086

**Contract Task Order No. 0258
Modification No. 02**

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**SITE 15 NON-TIME-CRITICAL REMOVAL ACTION
ACTION MEMORANDUM**

**NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA**

FINAL

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December 14, 1994

REMOVAL ACTION APPROVAL

As detailed in Section II of this action memorandum, conditions at Site 15 at the Naval Air Station in Alameda, California, meet the National Oil and Hazardous Substances Pollution Contingency Plan criteria for removal actions. Because a removal action is necessary at this site, excavation, on-site treatment and on-site disposal will result in the most comprehensive and cost effective action at the site. Therefore, the Navy approves of the recommended removal action: excavate soil, treat it on site, and return the treated soil to the excavated area. Documentation of Navy approval is indicated by the signatures shown below.

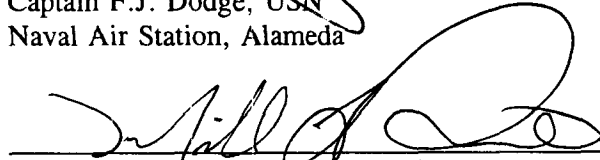
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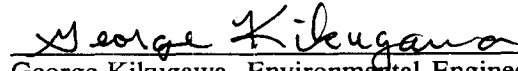
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DRAFT
SITE 15 REMOVAL ACTION, ACTION
MEMORANDUM ADDENDUM

DATED 19 DECEMBER 2000

IS FILED AS ADMINISTRATIVE RECORD NO.
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REVISED DRAFT
INSTALLATION RESTORATION SITE 15 LEAD
NON-TIME CRITICAL REMOVAL ACTION, ACTION
MEMORANDUM ADDENDUM

DATED 24 AUGUST 2001

IS FILED AS ADMINISTRATIVE RECORD NO
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I. INTRODUCTION

This action memorandum (AM) documents the Navy's decision to conduct a non-time-critical removal action at Site 15 at Naval Air Station (NAS) Alameda, California. In conjunction with the California Environmental Protection Agency's Department of Toxic Substances Control (DTSC) and the United States Environmental Protection Agency (EPA), a decision was made by the Navy to remove soil with elevated levels of lead and polychlorinated biphenyl (PCB) compounds at Site 15. The decision making process executed by the Navy, DTSC, and EPA included careful consideration of cleanup levels that address federal and State cleanup requirements for both lead and PCB in soil, with the Navy ultimately choosing cleanup levels that are more stringent and protective of human health and the environment. The chosen cleanup goals could allow for the unrestricted use of the site property, an important consideration to both the Navy and community as NAS Alameda prepares for future transfer of property.

Navy decision making for the removal action at Site 15 has been guided not only by regulatory requirements and a desire to protect human health and the environment but also by public concerns for selecting cleanup options with permanent results. The removal action remedy originally planned for Site 15 included excavation and landfilling of contaminated soil. Based on public comment, the Navy revised the proposed remedy to include an innovative technology that offered a permanent solution. The preferred alternative in the engineering evaluation/cost analysis (EE/CA) report, which was distributed for public review and comment on April 19, 1994, was soil solvent extraction and acid washing. Overall public responses were favorable to the selected approach, which reflected their preference for a permanent solution.

Subsequently, the Navy decided to implement an innovative soil washing technology that was more efficient and cost effective than solvent extraction/acid washing. This removal action was discussed with the public at Restoration Advisory Board (RAB) meetings in May, June, August, and September 1994. At the November 1, 1994, RAB meeting a Site 15 removal action fact sheet was distributed to the attendees. The effectiveness of the selected soil washing treatment technology has been demonstrated at bench-scale. The U.S. EPA's Superfund Innovative Technology Evaluation (SITE) program will evaluate and monitor the overall performance of the soil washing technology during the initial field stage of soil treatment.

Site 15 is known to contain soil with elevated PCB concentrations and lead concentrations exceeding the total threshold limit concentration (TTLC) toxicity criteria for a hazardous waste according to California Code of Regulations Title 26, Division 22, Section 66261.24 (CCR Title 26, Division 22, §66261.24). Site-specific applicable or relevant and appropriate requirements (ARARs) have been recently requested from the State of California. State site-specific ARARs were not available when planning began for the Site 15 removal action in 1993. To develop interim cleanup goals, the Navy, DTSC, Regional Water Quality Control Board (RWQCB), and EPA met and concurred at a Base Realignment and Closure [BRAC] Cleanup Team [BCT] technical review meeting held on January 11, 1994, on interim cleanup levels/preliminary remediation goals (PRGs) for the removal of PCB- and lead-contaminated soil at Site 15. The federal PRG established for PCBs in soil is 1 milligram per kilogram (mg/kg or equivalent to one part per million); the California-modified PRG established for lead in soil is 130 mg/kg. These PRGs are protective of human health, and the Navy considers the protection of human health a priority. Rationale for determination of these interim cleanup levels/PRGs is presented in section V.A.1.

The Navy has determined that a non-time-critical removal action is appropriate at this site based on consideration of the following factors established in the Title 40 Code of Federal Regulations (CFR) Part 300.415(b)(2) (40 CFR 300.415).

- (i) Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances, pollutants, or contaminants
- (iv) High levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface that may migrate
- (v) Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released

The removal action will reduce the volume, toxicity, and mobility of contaminants by excavating contaminated soil, treating excavated soil on site, and returning treated soil to the excavation area. The removal action is consistent with protecting water quality because it will result in removal of a potential source of groundwater and surface water contamination. Upon completion of the removal action, human health and ecological risk assessments will be performed during the remedial

investigation/feasibility study (RI/FS) process. Results of these risk assessments will be considered in assessing final remedies, if necessary, and the long-term use of Site 15.

II. SITE CONDITIONS AND BACKGROUND

The following three sections provide a general description of Site 15, a description of past and current site activities, and a statement of state and local authorities' roles in overseeing removal action activities at this site.

A. SITE DESCRIPTION

This section describes the history of releases at Site 15, the site's location and relationship to surrounding sites, site-specific characteristics, the chemical-specific characteristics of the release, and the status of the site with respect to the National Priorities List (NPL). All information pertaining to the characterization of Site 15 is contained in the Administrative Record. The Administrative Record is available for public review at the Environmental Information Repository Room, Building 1, NAS Alameda and in the information repository at the Alameda Main Library at 2264 Santa Clara Avenue, Alameda.

1. Removal Site Evaluation

Site 15 consists of Building 283, Building 301, the concrete foundation of former Building 389, and the associated yards of all three buildings (Canonie 1990). Buildings 283 and 301 were used for storage of electrical equipment, oil-filled transformers, and old, unused machinery. Before Building 389 was torn down (the concrete slab is still in place), it stored transformers (Canonie 1990).

Prior to 1974, transformers were stored on bare ground in the vicinity of Buildings 283, 301, and 389. An estimated 200 to 400 gallons of oil containing PCBs from transformers may have been stored at any one time. Personnel recalled occasional leaks of the PCB-containing oil. PCB-containing oil was also drained from the transformers on a regular basis and sprayed on the grounds around the nearby buildings for weed control before regulations were promulgated prohibiting this use (Ecology and Environment, Inc. [E&E] 1983).

The key problem at Site 15 is elevated levels of PCBs and lead in surface soils in close proximity to surface and groundwater.

2. Physical Location

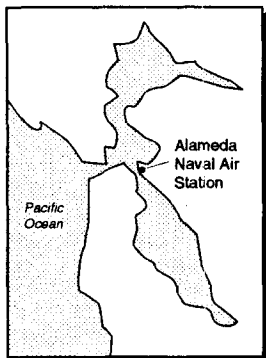
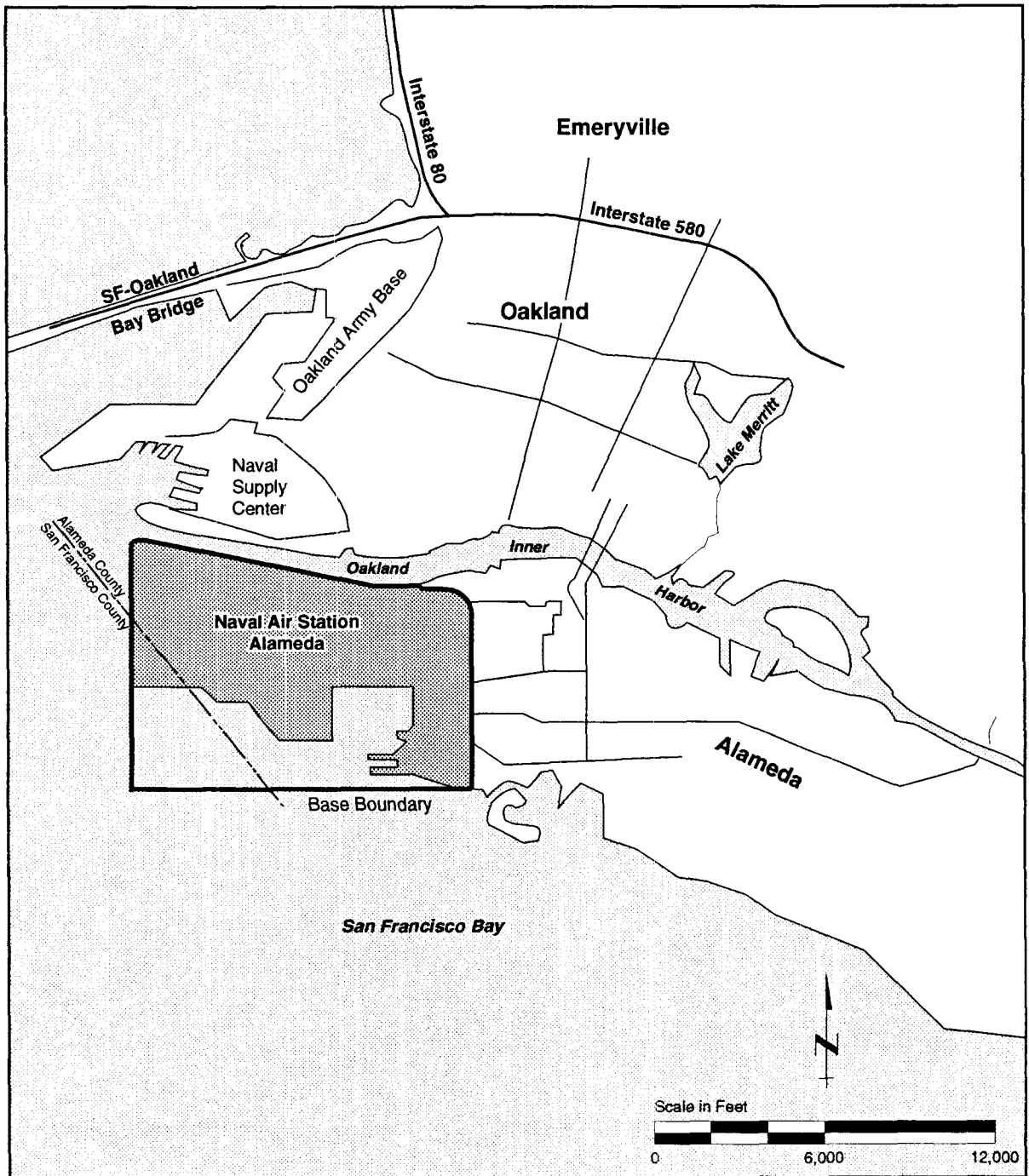
NAS Alameda is located at the west end of Alameda Island, in Alameda and San Francisco Counties, California (Figure 1). Alameda Island lies along the eastern side of San Francisco Bay, adjacent to the city of Oakland. The air station occupies 2,634 acres (onshore and offshore) and is approximately 2 miles long and 1 mile wide onshore. Site 15 at NAS Alameda is located in the northern portion of the air station, north of Runway 7-25 and Perimeter Road and approximately 250 feet south of the Oakland Inner Harbor (Figure 2). The nearest residential area is located approximately 1.5 miles east from Site 15.

3. Site Characteristics

The NAS Alameda base fire department currently uses Buildings 283 and 301 located at the southwest corner of Site 15, for storage of equipment (Figure 3). The area around both buildings is fenced. The remainder of the site consists of the foundation of Building 389 and an empty lot, and is used as a storage yard by one of the base maintenance groups. The entire site is enclosed by an approximately 8-foot-high, chain-link fence, with posted signs stating "Warning-PCB Contamination in Surface Soil-Unauthorized Personnel Prohibited".

Soil at Site 15 contains PCBs and lead in surface soils. PCBs and lead have been detected in most surface-soil and soil boring samples from depths ranging from 0.5 feet below ground surface (bgs) to 2 feet bgs. At depths greater than or equal to 2 feet bgs, PCBs were not detected, and lead was detected at concentrations less than 10 milligrams per kilogram (mg/kg).

This is the first response action at Site 15.



Source: Modified from CA State Automobile Assoc. map, Oakland/Berkeley/Alameda. Copyright 1980, revised 1989.

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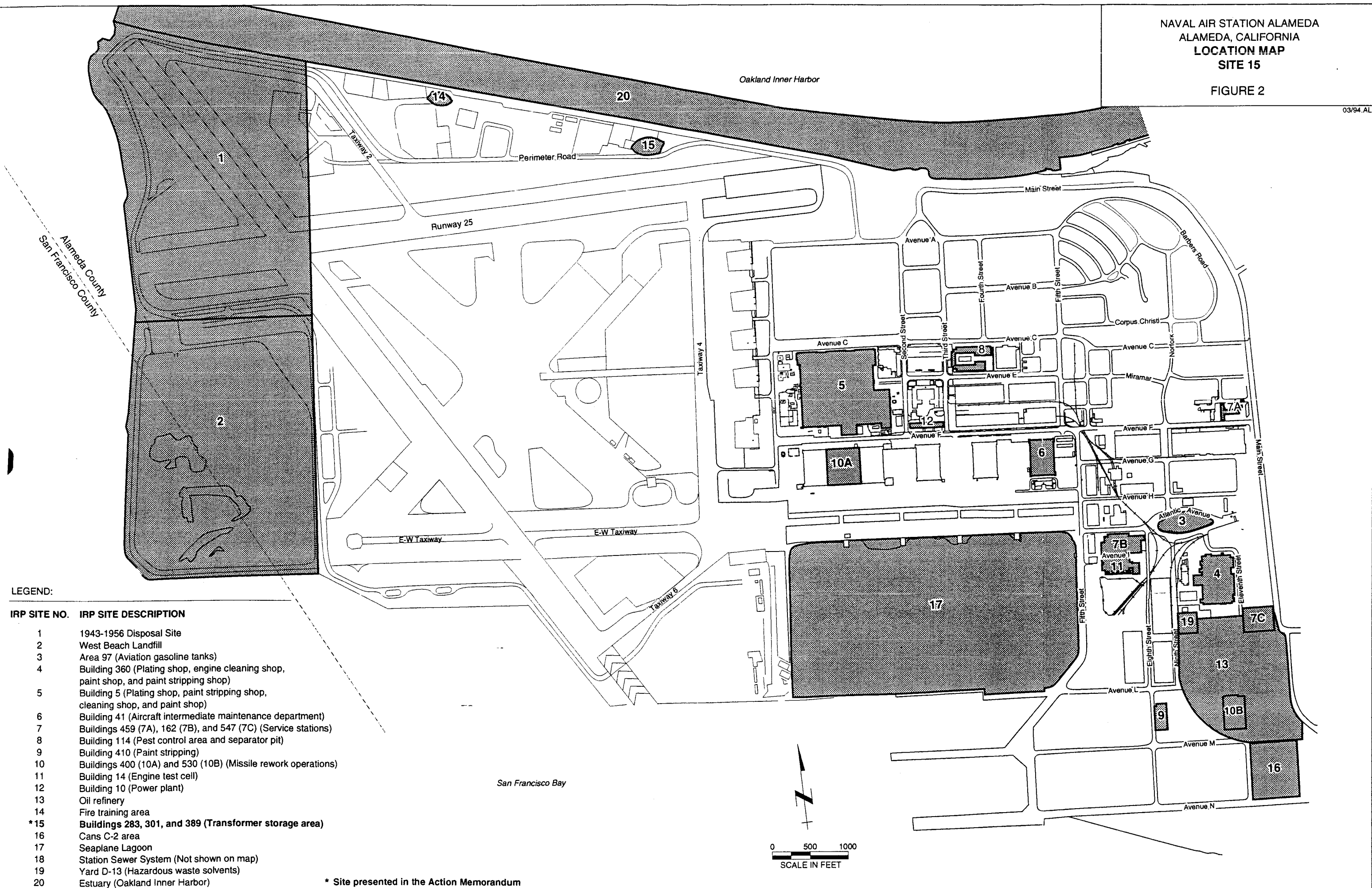
NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA

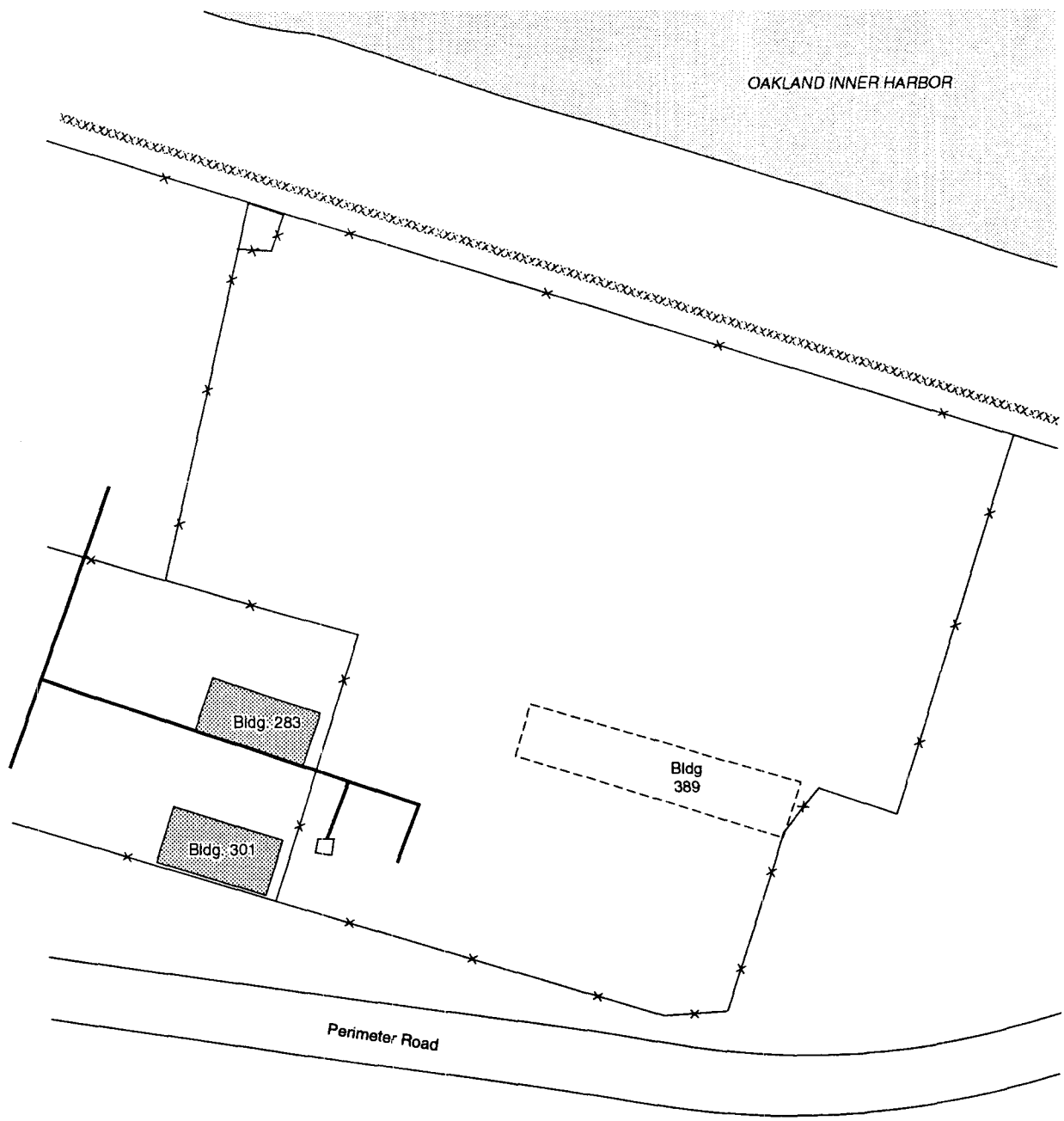
REGIONAL LOCATION MAP OF
NAS ALAMEDA

FIGURE 1







FIGURE 2

03/94.AL

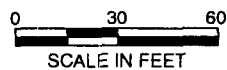




LEGEND:

-  Catch Basin
-  Storm Sewer Line
-  Building
-  Former Building
-  Fence
-  Elevated Berm

Notes:
Base map CAD File provided by NAS Alameda



**NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITE MAP
SITE 15**

FIGURE 3

4. Release or Threatened Release

Contaminated surface soil at Site 15 contains elevated levels of PCBs (Aroclor-1260, up to 19 mg/kg) and lead (up to 1350 mg/kg) exceeding the TTLTC toxicity criteria for a hazardous waste according to Title 22, § 66261.24. PCBs are a hazardous substance according to 40 CFR 300.5. PCBs are subject to land disposal restrictions (LDR) under 40 CFR 268.32. Lead is a hazardous substance as established in 40 CFR 300.5.

The PCBs and lead in soil resulted from historical use at Site 15. Current site conditions may result in additional releases of PCBs into the air and lead through subsurface soils into the shallow groundwater beneath the site. Potential routes of migration of PCBs and lead include direct contact, airborne fugitive dust, infiltration to groundwater, surface water migration, and transport through the aquifer. PCBs and lead could affect the Oakland Inner Harbor through site groundwater because the site groundwater is shallow and the site is close to the Oakland Inner Harbor. Migration of PCBs and lead into the adjacent Oakland Inner Harbor through surface water migration is possible though unlikely because an elevated berm lies between the site and the Harbor. An ecological assessment has been drafted under the RI/FS for NAS Alameda.

5. National Priorities List Status

NAS Alameda is not currently and is not proposed to be on the NPL. NAS Alameda has been evaluated by the EPA using the hazard ranking system.

B. OTHER ACTIONS TO DATE

This section describes previous actions and current activities at NAS Alameda.

1. Previous Actions

NACIP Program Investigation

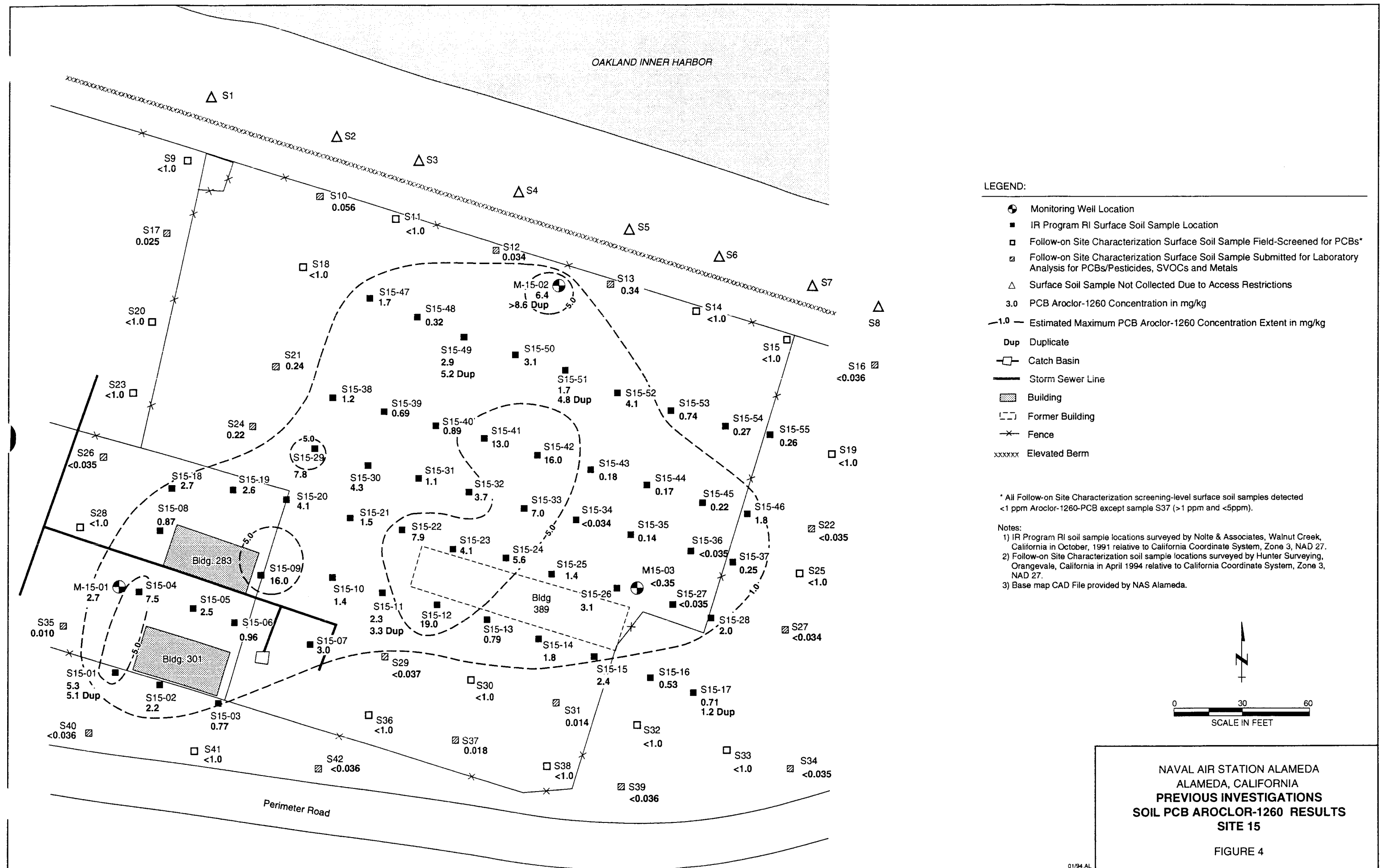
Surface soil sampling during the verification step of the Navy Assessment and Control of Installation Pollutants (NACIP) program was conducted by Wahler Associates in 1985. Twelve surface soil samples were collected north of the Building 389 concrete foundation. The samples were analyzed for PCBs only. The highest PCB concentration detected was 3 mg/kg (Wahler 1985).

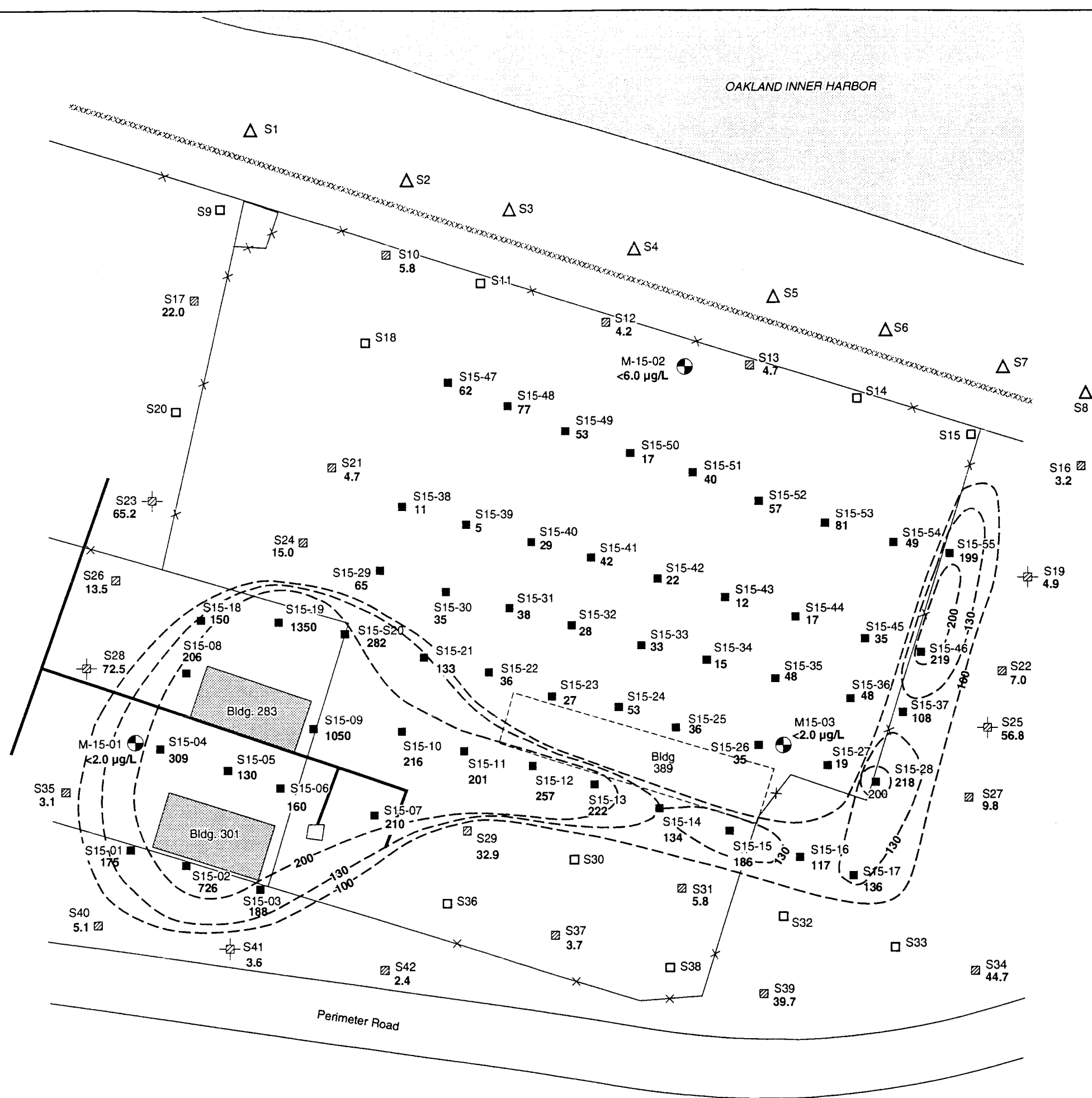
IR Program Remedial Investigation

The remedial investigation (RI) conducted by PRC Environmental Management, Inc. and its Comprehensive Long-term Environmental Action Navy (CLEAN) team subcontractor, Montgomery Watson (formerly known as James M. Montgomery Consulting Engineers [JMM]) (referred to collectively as the PRC team) in 1992 at Site 15 included surface geophysics, surface soil sampling, drilling soil borings, subsurface soil sampling, installation and sampling of monitoring wells, in situ permeability testing, and groundwater level measuring (PRC and JMM 1992). Surface soil samples collected at Site 15 contained moderate concentrations of PCBs and lead, and low concentrations of pesticides, semivolatile organic compounds (SVOC), and metals. The PCB Aroclor-1260 was detected in 58 of 61 surface soil samples collected (Figure 4). Concentrations detected in surface samples ranged from 0.140 mg/kg to 19 mg/kg. Lead concentrations detected in surface soil samples ranged from 5 mg/kg to 1,350 mg/kg (Figure 5). Subsurface soil samples were collected at depths of 2, 8, and 12 feet bgs and analyzed for PCBs/pesticides, volatile organic compounds (VOC), SVOCs, and metals. At depths greater than or equal to 2 feet bgs, PCBs were not detected, and lead was detected only at concentrations less than 10 mg/kg. Low concentrations of VOCs, SVOCs, and metals were detected in surface and subsurface soil samples. No PCBs/pesticides, VOCs, SVOCs, or lead have been detected in the groundwater.

Follow-on Site Characterization

Surface soil sampling was conducted by the PRC team on December 28, 1993 to delineate the extent of PCBs and lead in surface soil at Site 15. Sampling was performed in accordance with the

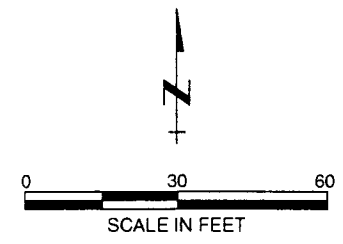




LEGEND:

- Monitoring Well Location
- IR Program RI Surface Soil Sample Location
- Follow-on Site Characterization Surface Soil Sample Location
- ▣ Follow-on Site Characterization Surface Soil Sample Submitted for Laboratory Analysis for Metals (Including Lead)
- ⊕ Additional Follow-on Site Characterization Sample Submitted for Laboratory Analysis for Lead Only
- △ Surface Soil Samples Not Collected Due to Access Restrictions
- 150 Lead Concentration* (mg/kg) (Surface)
* at 2.0 ft. bgs, lead <10 mg/kg
- 100- Estimated Maximum Lead Concentration Extent in mg/kg
- ⊞ Catch Basin
- Storm Sewer Line
- ▤ Building
- ▤ Former Building
- X- Fence
- xxxxxx Elevated Berm

Notes:
 1) IR Program RI soil sample locations surveyed by Nolte & Associates, Walnut Creek, California in October, 1991 relative to California Coordinate System, Zone 3, NAD 27.
 2) Follow-on Site Characterization soil sample locations surveyed by Hunter Surveying, Orangevale, California in April 1994 relative to California Coordinate System, Zone 3, NAD 27.
 3) Base map CAD File provided by NAS Alameda.



NAVAL AIR STATION ALAMEDA
 ALAMEDA, CALIFORNIA
 PREVIOUS INVESTIGATIONS
 SOIL TOTAL LEAD RESULTS
 SITE 15

FIGURE 5

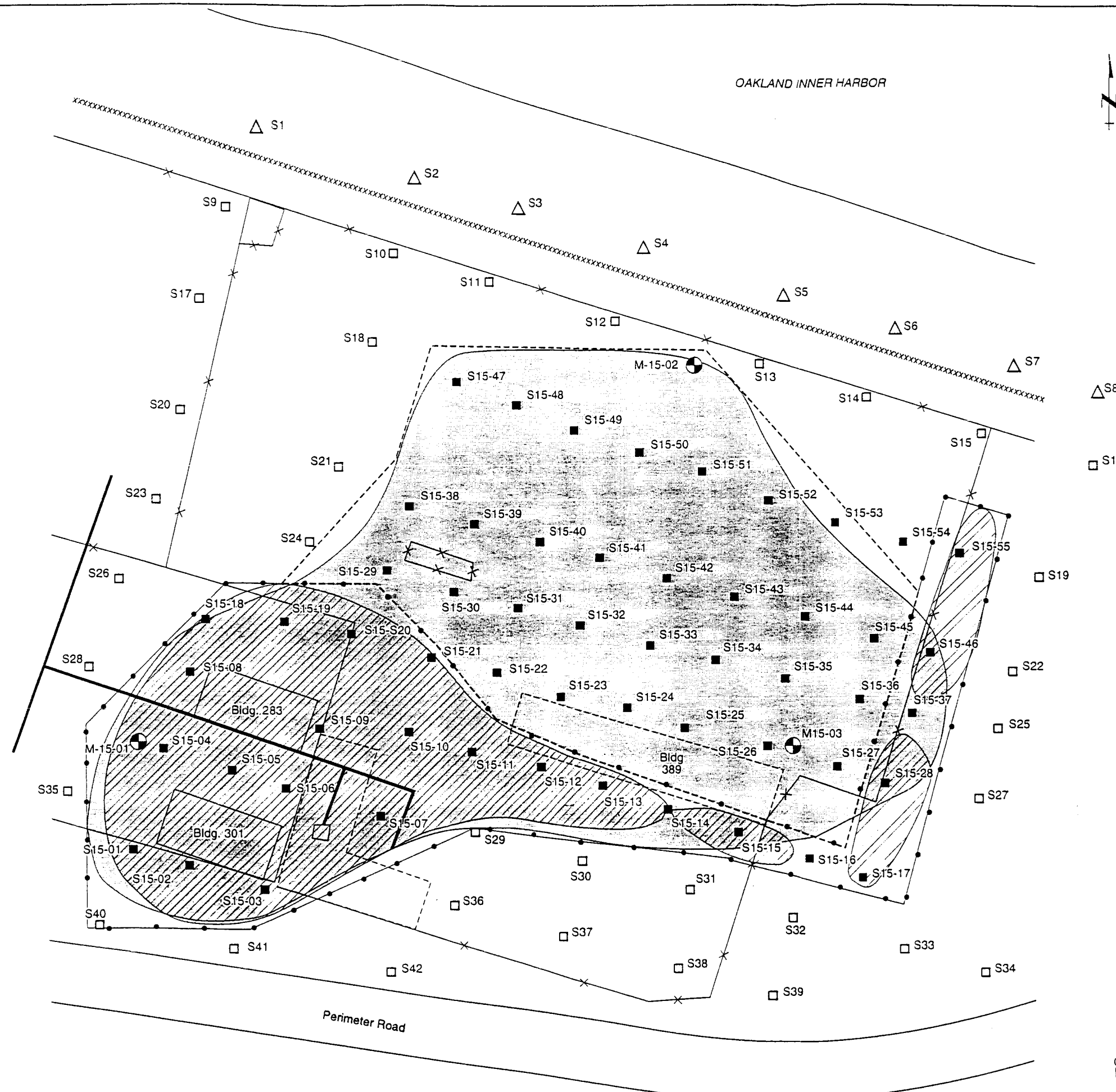
"Removal Action Site 15 Field Investigation Work Plan (Final)" dated March 28, 1994, and results are presented in the "Site 15 Removal Action Engineering Evaluation/Cost Analysis Report (Final)," dated October 13, 1994. The sampling program was conducted in two phases in which initial field screening samples were first collected and analyzed for PCBs in the field to estimate the extent of PCBs. Based on the field screening results, final confirmation samples were then selected for PCB analysis to aid in assessing the lateral extent of PCBs in surface soil. Selected final confirmation samples were also analyzed to evaluate the extent of lead in surface soil that may require remediation.

Thirty-four surface soil samples were collected from Site 15 in a gridded pattern, as shown on Figure 4. Field screening results for PCBs indicated that all samples measured below 1.0 mg/kg for Aroclor-1260, except for sample S15-S37, which contained between 1.0 mg/kg and 5 mg/kg of Aroclor-1260. Based on PCB results from previous investigations and from the field screening samples, the PRC team collected and submitted 18 final confirmation soil samples for off-site laboratory analysis for PCBs/pesticides, SVOCs, and metals (Figures 4 and 5). Five additional final confirmation samples were collected and submitted for laboratory analysis for lead only (Figure 5). All final confirmation sample results indicated that PCB Aroclor-1260 concentrations were detected below 1.0 mg/kg (Figure 4). Lead concentrations detected are shown on Figure 5 and ranged from less than 1.0 mg/kg to 72.5 mg/kg. Based on results from previous investigations and from the final confirmation samples, the extent of PCBs and lead in surface soil at Site 15 was estimated for this removal action (Figure 6) (PRC and Montgomery Watson 1994).

2. Current Activities

The RI at NAS Alameda is expected to be complete by May 1997. The RI includes investigation of 23 sites, a baseline human health risk assessment, a baseline ecological risk assessment, treatability studies, feasibility studies, and the preparation of proposed plans and records of decision for four operable units.

Site 15 is included as a site in Operable Unit 2 of the RI. This is the first removal action at Site 15.



OAKLAND INNER HARBOR



LEGEND:

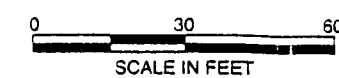
- Monitoring Well Location
- IR Program RI Surface Soil Sample Location
- Follow-on Site Characterization Surface Soil Sample Location
- △ Surface Soil Samples Not Collected Due to Access Restrictions
- - - Estimated Extent of Excavation of Soil Containing PCBs
- - - Estimated Extent of Excavation of Soil Containing Lead
- ▨ PCB Aroclor-1260 Concentrations Above 1.0 mg/kg
- ▨ Lead Concentrations Above 130 mg/kg
- ⊞ Catch Basin
- Storm Sewer Line
- × Fence
- xxxxxx Elevated Berm

Notes:

- 1) IR Program RI soil sample locations surveyed by Nolte & Associates, Walnut Creek, California in October, 1991 relative to California Coordinate System, Zone 3, NAD 27.
- 2) Follow-on Site Characterization soil sample locations surveyed by Hunter Surveying, Orangevale, California in April 1994 relative to California Coordinate System, Zone 3, NAD 27.
- 3) Base map CAD File provided by NAS Alameda.

NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
**ESTIMATED EXTENT OF SOIL REMEDIATION
SITE 15**

FIGURE 6



C. STATE AND LOCAL AUTHORITIES' ROLE

Representatives from the DTSC, the EPA, and the NAS Alameda base environmental coordinator form the BCT which acts in consensus to make decisions pertaining to the Navy's CERCLA response activities at NAS Alameda. Concurrence of DTSC has been sought for this removal action. The BCT has acted in consensus to determine interim cleanup levels/PRGs for this removal action.

III. THREATS TO PUBLIC HEALTH OR WELFARE OR THE ENVIRONMENT

Due to the presence of contaminated soils at Site 15, the Navy has made a determination, based on the factors outlined below, that there is a potential threat to public health or welfare or the environment, and that it is appropriate to take a removal action pursuant to CERCLA Section 104(a) to minimize the potential for environmental impact. Elevated levels of PCBs and lead have been detected in surface soil samples (0 to 6 inches bgs).

A. THREATS TO PUBLIC HEALTH OR WELFARE

The proposed removal action is intended to reduce the threat of human exposure identified below that results from contaminated soil at Site 15. These threats directly relate to the criteria in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) § 300.415(b)(2).

- **Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances, pollutants, or contaminants.** Humans working at the site may be exposed to the contaminated soils containing PCBs and lead by direct contact or ingestion of dust. Lead concentrations in soil exceed the proposed cleanup goal of 130 mg/kg, the default value used by DTSC (DTSC 1994).
- **High levels of hazardous substances or pollutants or contaminants in soils that may migrate.** Infiltrating rainwater may cause lead in soil to migrate to groundwater, which is 2.5 to 5.2 feet bgs (groundwater elevations are influenced by tidal and seasonal fluctuation). PCBs and lead are not likely to be washed with surface runoff into the adjacent Oakland Inner Harbor during rainfall because an elevated berm lies between the site and the Harbor.
- **Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released.** Arid weather conditions and high winds may cause PCBs in soil to become airborne on fugitive dust.

B. THREATS TO THE ENVIRONMENT

The proposed removal action is intended to reduce the potential for environmental impact identified below due to contaminated soil at Site 15. These threats directly relate to the criteria in the NCP § 300.415(b)(2).

- **Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances, pollutants, or contaminants.** PCBs and lead may enter the food chain through direct contact and ingestion by burrowing animals or plant uptake and subsequent ingestion by wildlife. PCBs and lead are toxic by ingestion and accumulate within animal tissue. No sensitive or endangered plant species exist at Site 15.
- **High levels of hazardous substances or pollutants or contaminants in soils that may migrate.** Infiltrating rainwater may cause lead in soil to migrate to groundwater, which is 3 to 5 feet bgs (groundwater elevations are influenced by tidal and seasonal fluctuation). Although unlikely, PCBs and lead could be washed with surface water runoff into the nearby Oakland Inner Harbor during extremely high rainfall events.
- **Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released.** The Oakland Inner Harbor is adjacent to Site 15. Arid weather conditions and high winds may cause PCBs in soil to become airborne on fugitive dust, thus affecting the Harbor.

IV. ENDANGERMENT DETERMINATION

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action described in this action memorandum, may present an imminent and substantial endangerment to public health or welfare or the environment.

V. PROPOSED ACTION AND ESTIMATED COSTS

This section provides a discussion on the details of the proposed removal action and its estimated costs.

A. PROPOSED ACTION

The following sections describe the proposed removal action and its contribution to remedial response, describe the EE/CA, identify ARARs, and provide a project schedule.

1. Proposed Action Description

The proposed removal action will be described in detail in the Site 15 removal action implementation work plan, which is in preparation. The removal action will consist of the following:

- Demolition of buildings
- Excavation of surface soil
- Confirmatory excavation sampling
- On-site treatment
- Confirmatory on-site treatment sampling
- Backfill of excavated area with treated and clean fill soil

Building 283, Building 301, and the foundation of Building 389 will be demolished and the remains stockpiled, sampled for evaluating disposal options, and transported and disposed of off site.

Soil will be excavated at Site 15 where elevated PCB and lead concentrations were detected in surface soils above certain concentrations. The goal of the proposed removal action is to reduce risk to human health and the environment by removing soil containing PCB concentrations greater than 1.0 mg/kg and lead concentrations greater than 130 mg/kg. The interim cleanup level/ federal PRG of 1.0 mg/kg for PCBs is considered by EPA in their Guidance on Remedial Actions for Superfund Sites with PCB Contamination as that level which would not pose an unacceptable human health risk under a residential scenario considering ingestion, inhalation, and dermal contact exposure pathways (EPA 1990). The interim cleanup level/California-modified PRG of 130 mg/kg for lead is the default value used by DTSC as stated in the Preliminary Endangerment Assessment Guidance Manual (DTSC 1994). Inorganic lead concentrations less than 130 mg/kg in soil constitute an acceptable human health risk (DTSC 1994). These proposed removal action cleanup goals were agreed to by the BCT acting in consensus. Upon completion of the removal action, human health and ecological risk assessments will be conducted at this site during the RI/FS. These risk assessments will be developed based on the residual concentrations remaining at the site after removal action activities are complete.

Results of these risk assessments will be considered in assessing final remedies, if necessary, and the long-term use of Site 15.

Based on the interim cleanup level/PRG of 1.0 mg/kg for PCBs and 130 mg/kg for lead, the estimated limits of the excavation will be approximately 300 feet by 150 feet laterally, and 2 feet bgs, yielding a soil volume of approximately 3,700 cubic yards. Soils will be excavated and stockpiled using conventional earthwork equipment such as a backhoe, bulldozers, and front-end loaders. The area of excavation is shown on Figure 6. The limits of excavation will be determined through confirmatory sampling to verify that soil containing greater than 1.0 mg/kg PCBs and 130 mg/kg lead has been removed. Samples will be analyzed in accordance with the Site 15 removal action implementation work plan.

Excavated soil will be stockpiled and treated on site by soil washing. The removal action remedy originally planned for Site 15 included excavation and landfilling of contaminated soil. Based on public comment, the Navy revised the remedy to include an innovative technology that offered a permanent solution. The innovative removal action alternative selected in the EE/CA report which was distributed for public review and comment on April 19, 1994, was soil solvent extraction and acid washing. Overall public responses were favorable to the selected approach, which reflected their preference for a permanent solution. Subsequently, the Navy decided to implement a different soil washing technology that was more efficient and cost effective than solvent extraction/acid washing. This removal action was discussed with the public at RAB meetings in May, June, August, and September 1994. At the November 1, 1994, RAB meeting a Site 15 removal action fact sheet was distributed to the attendees.

Although, soil washing is not a fundamentally different technology than solvent extraction or acid washing, the overall effectiveness of the selected soil washing treatment technology has only been demonstrated at the bench-scale. For this removal action, a soil washing treatability study will be performed at Site 15 to confirm that the treatment process satisfies all performance specifications as described in the implementation work plan. Oversight of this initial stage of the soil treatment will be conducted by EPA's SITE program. Part of this oversight includes quality control checks such as the collection of samples to evaluate technology effectiveness. If soil washing is found to be effective at removing PCBs and lead to acceptable levels, the SITE program oversight will be discontinued and

the soil treatment will be completed. However, if soil washing proves unsuccessful, the SITE program oversight will be discontinued and the Site 15 removal action may be completed by implementing the originally preferred removal alternative presented in the EE/CA report (excavation, on-site treatment by solvent extraction and acid washing, and on-site disposal by backfilling into the excavation area). Wastewater will be treated to remove PCBs and lead prior to disposal to the wastewater treatment plant.

The BioGenesis soil washing process begins by loading contaminated soil into 16,000-gallon complexing tanks. A slurry will be created in these tanks by adding BioGenesis proprietary complexing agents, whose properties are environmentally Benign By Design™, and water from the water storage tank. This slurry will complex the lead into the aqueous phase and remove the lead from the soil matrix. The slurry tanks can be covered by a hood (if required) to guard against any possibility of VOC escape. BioGenesis anticipates that this will not be needed.

Once the lead has complexed, the slurry tanks will be drained by pumping water into the lead precipitation tanks where the pH will be adjusted to precipitate the lead from the water. Once precipitation is completed, water will be pumped back into the slurry tanks and the lead precipitate drained into a container filter for dewatering.

The slurry will then be pumped to a wet screen and then to the BioGenesisSM Sediment Washer, where it will meet additional water and BioGenesis proprietary surfactant for PCB removal. The slurry will flow through the BioGenesisSM Sediment Washer which removes the PCBs from the soil matrix. The resulting slurry will pass through a second wet screen for initial liquid-solid separation. Clean sediment will be held in a 20 yard roll off bins.

From the second wet screen, liquid-solid separation will continue by use of hydrocyclones and/or centrifuge. Further liquid-solid separation will be accomplished via bag filter if necessary. After liquid-solid separation, PCBs will be removed from the water phase.

PCBs will be treated via UV/oxidation or by filtration, depending on the quantity of PCBs actually encountered at NAS Alameda. From this stage, water will be recycled through the system until the end of the project when it will be cleaned to discharge standards as set by the receiving facility.

Post-treatment confirmatory sampling will be performed to verify that the treated soil contains less than 1.0 mg/kg PCBs and 130 mg/kg lead and meets California and federal requirements for on-site backfilling. Waste extraction tests (WET) will be performed on selected post-treatment soil samples to verify that leachable lead is less than the soluble threshold limit concentration (STLC) of 5.0 milligrams per liter (mg/L). Thus, soil to be backfilled will not exhibit the characteristic of toxicity. Clean fill will also be used if necessary.

2. Contribution of Remedial Performance

The proposed action at Site 15 will result in removal of soil containing elevated concentrations of PCBs and lead, thus reducing the potential for migration of contaminants to groundwater. This removal response is consistent with overall facility strategy in addressing Installation Restoration (IR) sites and is expected to be consistent with other response actions to be taken at the facility. The response action will not preclude further response actions, if necessary, at Site 15. Site 15 will be evaluated further during the RI at NAS Alameda. The residual concentrations of PCBs and lead remaining after the action may require no additional cleanup if the 1.0 mg/kg PCBs and 130 mg/kg lead concentrations are compatible with future uses of the site as determined by the human health and ecological risk assessment part of the ongoing RI/FS.

3. Description of Alternative Technologies

Excavation of the PCB- and lead-contaminated soils, treatment on site, and returning the treated soils to the area of excavation was determined to be the best approach for managing the contaminated soils at Site 15 based on effectiveness, implementability, and cost. Soil washing was the treatment technology chosen because the cost is significantly lower than solvent extraction and acid washing. This section describes alternative technologies considered.

Alternatives considered include:

- Excavation with on-site soil washing, and on-site disposal
- Excavation with on-site solidification or stabilization, and on-site disposal
- Excavation with on-site solvent extraction and stabilization or on-site solvent extraction and acid washing, and on-site disposal

- Excavation and off-site incineration
- Excavation and off-site disposal with or without pretreatment

The effectiveness of excavation with on-site solidification or stabilization, and on-site disposal is moderate because stabilization has not been proven to reduce mobility of PCBs. Excavation with on-site solvent extraction and stabilization or on-site solvent extraction and acid washing, and on-site disposal was found to be less cost effective than soil washing. Excavation and off-site incineration is cost prohibitive. Excavation and off-site disposal with or without pretreatment would achieve the removal action objectives, but treatment approaches are favored over land disposal approaches according to CERCLA.

4. Engineering Evaluation/Cost Analysis

The identification, evaluation, and selection of the removal action alternative is presented in the "Site 15 Removal Action Engineering Evaluation/Cost Analysis Report (Final)," dated October 13, 1994, and is provided as Attachment A to this action memorandum. The Responsiveness Summary (the response to agency and public comments on the EE/CA report) is included as Attachment B and the rationale for performing a removal action at Site 15 is described in the EE/CA approval memorandum provided as Attachment C.

5. Applicable or Relevant and Appropriate Requirements

The Navy has identified potential ARARs for the removal action at Site 15, NAS Alameda as practicable for the site. As stated earlier, the Navy has determined that it is appropriate to take a removal action pursuant to CERCLA Section 104(a) to reduce the potential threat to public health or welfare or the environment. These threats directly relate to the criteria in the NCP Section 300.415(b)(2). Additional potential federal ARARs include, but are not limited to, the following:

- RCRA Subtitle C requirements governing standards for owners and operators of hazardous waste treatment, storage, and disposal facilities (NAS Alameda) (40 CFR Parts 264, 265):
 - (1) Groundwater Protection and Monitoring (40 CFR 264.90-264.109)
 - (2) Closure and Post Closure (40 CFR 264.110-264.120)
 - (3) Landfills (40 CFR 264.300-264.339)

(4) Land Disposal Restrictions (40 CFR 268.1-268.50)

- Clean Water Act, as amended (33 U.S.C. 1251), requirements established pursuant to sections 301, 302, 303 (including state water quality standards), 304, 306, 307 (including federal pretreatment requirements for discharge into a publicly owned treatment works), 308, 402, 403, and 404 of the Clean Water Act. (33 CFR Parts 320-330, 40 CFR Parts 122, 123, 125, 131, 230, 231, 233, 400-469).
- TSCA (15 U.S.C. 2601) requirements for PCBs generally (40 CFR Part 761) including storage and disposal of PCBs (40 CFR 761.60-761.79).
- Clean Air Act (42 U.S.C. 7401) requirements for National Emission Standards for Hazardous Air Pollutants (40 CFR Part 61). See also 40 CFR 427.110-427.116, 763.

The following administrative and substantive requirements were determined to be applicable to off-site actions:

- DOT requirements for transportation of hazardous materials (manifest requirements, storage, and labeling of waste) (49 CFR Parts 107, 171, 172).

When the Site 15 removal action was planned, the Navy, DTSC, RWQCB, and EPA concurred (at a BCT technical review meeting held on January 11, 1994) on interim cleanup levels/PRGs for the removal of PCB- and lead-contaminated soil at Site 15. The federal PRG established for PCBs is 1.0 mg/kg and is considered by the EPA as that level which would not pose an unacceptable human health risk under a residential scenario considering ingestion, inhalation, and dermal contact exposure pathways and is the specified cleanup level found in 40 CFR 761. The 1.0 mg/kg interim cleanup level is a federal PRG for sites where unlimited exposure under residential land use is assumed. The California-modified PRG established for lead is 130 mg/kg and is the default value used by DTSC (DTSC 1994).

Based on further discussions with the DTSC representative, State laws and regulations were identified which might be applicable or relevant and appropriate to the removal action being planned for Site 15. The Department of the Navy, as lead agency, has analyzed the state requirements to be included as ARARs for the action at Site 15. Subsequently, facility-wide ARARs for NAS Alameda were requested from the State of California in a letter to California EPA, DTSC dated October 25, 1994.

Several requirements were proposed which related to the State's delegated responsibility to administer the regulatory responsibilities under the Resource Conservation and Recovery Act (RCRA). These requirements related to owners and operators of treatment, storage, and disposal facilities are generally found at Title 26, Division 22, California Code of Regulations, Section 66265. Further specific requirements related to groundwater protection (22 CCR 66265.90 et seq.), interim status and closure/post closure requirements (22 CCR 66265.110 et seq.), requirements for facilities that dispose of hazardous waste (22 CCR 66265.300 et seq.), as well as land disposal restrictions related to the identification, management, and transportation of hazardous waste (22 CCR 66268.1-66268.124). All of these requirements follow the RCRA Federal ARARs analysis and to the extent this removal action subjects the Navy to any of the substantive requirements that are more stringent than the Federal requirements, the State substantive requirements can be practically complied with. Since this removal action is being undertaken under the provisions of CERCLA and the NCP, the purely procedural requirements of any ARAR including the need to secure a permit are not required for any part of the required action undertaken entirely onsite.

While provisions of the Clean Water Act were identified as ARARs, this removal action is focused entirely on a soil response. No groundwater remediation is currently proposed to be undertaken as a removal action. Ultimately, IR Site 15 will be evaluated along with the rest of the facility to determine what remedial response actions, if any, need to be undertaken. As a result of the full RI/FS, a decision regarding all aspects of remediation including groundwater will be made. This decision is expected some time in 1997. At this point further consideration of groundwater related ARARs in a removal action is not warranted.

Finally, to the extent that fugitive dust meets the State's definition of "air pollutant" or "air contaminant" (Health & Safety Code 39013), the Department of the Navy will comply with the relevant requirements of the California Health and Safety Code, Sections 39900 and 41500.

While the Department of the Navy fully intends to comply with all Federal and State requirements related to worker safety and protection, such requirements are not environmental in nature and therefore are not subject to an ARARs analysis.

6. Project Schedule

The excavation will be performed according to a Site 15 removal action implementation work plan. Excavation will continue until soil samples are found to contain less than 1.0 mg/kg PCBs and less than 130 mg/kg lead. The Navy anticipates that approximately 8 months will be required to complete the removal action at Site 15: 1 month for site mobilization and preparation, 1 month for excavation, and 6 months for on-site treatment, backfilling, and demobilization.

B. ESTIMATED COSTS

The cost estimate presented in the EE/CA for excavation, on-site treatment by soil washing, and on-site disposal by backfilling into the excavation area is approximately \$2.4 million, and for excavation, on-site treatment by solvent extraction and acid washing, and on-site disposal by backfilling into the excavation area is approximately \$3.3 million. A revised cost estimate for performing the removal action with BioGenesis' soil washing system is presented as Table 1 in Attachment D.

VI. EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT TAKEN

Delayed action at Site 15 will result in continued potential for PCBs to be released into the air and lead to migrate through subsurface soils into the shallow groundwater beneath the site. Humans working at or near the site may be exposed to contaminated soils containing elevated PCB and lead concentrations by direct contact or ingestion of dust. PCBs and lead may enter the food chain through direct contact and ingestion by burrowing animals or plant uptake and subsequent ingestion by wildlife. Migration of PCBs and lead into the adjacent Oakland Inner Harbor is unlikely because an elevated berm lies between the site and the harbor.

VII. OUTSTANDING POLICY ISSUES

None.

VIII. ENFORCEMENT ACTIONS

The State of California currently has a remedial action order (RAO) with NAS Alameda. This RAO was registered in June 1988. Although the Navy has no obligation to follow the state-issued RAO, it fully intends to adhere to the intent of the RAO where practicable.

IX. RECOMMENDATION

This decision document presents the selected removal action for Site 15 at NAS Alameda, developed in accordance with CERCLA as amended, and is not inconsistent with the NCP. The selected action is excavating surface soil, treating soil on-site with soil washing, and backfilling treated soil to the excavation area. The basis of this removal response decision is chronicled in documents which make up the Administrative Record for this site.

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ATTACHMENT A

SITE 15 REMOVAL ACTION
ENGINEERING EVALUATION/COST ANALYSIS REPORT (FINAL)

CLEAN

Contract No. N62474-88-D-5086

Contract Task Order 0258

**Navy BRAC Environmental Coordinator: Lieutenant Michael Petouhoff
U.S. EPA Regional Project Manager: James Ricks, Jr.
California EPA Project Manager: Tom Lanphar
Navy Remedial Project Managers: Gary Muneawa and George Kikugawa
PRC Installation Coordinator: Duane Balch
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**NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA**

**SITE 15 REMOVAL ACTION
ENGINEERING EVALUATION/
COST ANALYSIS REPORT**

FINAL

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August 22, 1994

**NAVAL AIR STATION ALAMEDA
SITE 15 REMOVAL ACTION
ENGINEERING EVALUATION/COST ANALYSIS REPORT**

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ACRONYMS AND ABBREVIATIONS

APEG	Alkaline Polyethylene Glycolate
bgs	Below Ground Surface
BIF	Boiler and Industrial Furnace
CAA	Clean Air Act
CAC	Community Advisory Committee
Cal-EPA	California Environmental Protection Agency
CCR	California Code of Regulations
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act (of 1980 [Superfund statute])
CFR	Code of Federal Regulations
CLEAN	Comprehensive Long-term Environmental Action Navy
CTO	Contract Task Order
DTSC	Department of Toxic Substances Control
E&E	Ecology and Environment, Inc.
EE/CA	Engineering Evaluation/Cost Analysis
EPA	Environmental Protection Agency
FS	Feasibility Study
HOC	Halogenated Organic Compound
IAS	Initial Assessment Study
IRP	Installation Restoration Program
JMM	James M. Montgomery, Consulting Engineers, Inc.
KGME	Potassium Glycol Methyl Etherate
KPEG	Potassium Polyethylene Glycolate
LDR	Land Disposal Restriction
mg/kg	Milligrams per Kilogram
mg/L	Milligrams per Liter
NACIP	Navy Assessment and Control of Installation Pollutants
NAS	Naval Air Station
NCA	Noise Control Act
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NFA	No Further Action
NPDES	National Pollutant Discharge Elimination System
O&M	Operations and Maintenance
OSA	Office of Scientific Affairs
OSHA	Occupational Safety and Health Administration
PCB	Polychlorinated Biphenyl
PPE	Personal Protective Equipment
ppm	Parts per Million
PRC	PRC Environmental Management, Inc.
RCRA	Resource Conservation and Recovery Act
RD/RA	Remedial Design/Remedial Action
RI	Remedial Investigation
ROD	Record of Decision
RWQCB	Regional Water Quality Control Board
SB	Senate Bill

ACRONYMS AND ABBREVIATIONS

(Continued)

STLC	Soluble Threshold Limit Concentration
SVOC	Semivolatile Organic Compound
TCLP	Toxicity Characteristic Leaching Procedure
TSCA	Toxic Substances Control Act
TTLC	Total Threshold Limit Concentration
TTU	Temporary Treatment Unit
VOC	Volatile Organic Compound
WESTDIV	Western Division
WET	Waste Extraction Test

EXECUTIVE SUMMARY

This engineering evaluation/cost analysis (EE/CA) report addresses a removal action of vadose zone soil with elevated levels of polychlorinated biphenyls (PCBs) and lead at Installation Restoration Program (IRP) Site 15 at Naval Air Station (NAS) Alameda, California. The EE/CA describes the site background and history, summarizes previous and current site characterization efforts, establishes the nature and extent of contamination, presents site removal action objectives, identifies and screens general response actions and technologies, and develops and evaluates the removal action alternatives.

Site 15 at NAS Alameda occupies approximately 3 acres and is located in the northern portion of the base, north of Runway 7-25 and Perimeter Road and approximately 250 feet south of the Oakland Inner Harbor. The site consists of Buildings 283, 301, and 389. Prior to 1974, transformers containing oil with PCBs were stored at Site 15. PCBs were reportedly released in several incidents including occasional oil spills, routine drainage of oil from the transformers, and intermittently when site grounds were sprayed with oil for weed control. Currently, Buildings 283 and 301 are used by the base fire department for equipment storage and the area around Building 389 is used as a storage yard for one of the base maintenance groups.

The scope of the removal action at Site 15 at NAS Alameda is to remediate moderate levels of PCBs and lead detected in the vadose zone soil. Previous analytical data indicate that elevated levels of PCBs and lead were detected in surface soil samples (0 to 6 inches below ground surface [bgs]) and that no PCBs and only low levels of lead were detected in subsurface soil samples (greater than 2 feet bgs). Furthermore, no PCBs or lead have been detected in the groundwater. Removal action objectives are to mitigate the risk to human health and the environment associated with potential exposure to soils with elevated PCB and lead levels, and to reduce the potential impact to the groundwater. When removal activities are complete, Site 15 may be considered for inclusion in a no further action (NFA) record of decision (ROD) subject to the final site risk assessment. The target cleanup levels for the removal action are to remediate vadose zone soil with PCB concentrations at or above 1.0 milligrams per kilogram (mg/kg) and lead levels at or above 130 mg/kg. The estimated volume of vadose zone soil requiring remediation is 3,700 cubic yards.

General response actions and remedial technologies were identified and screened based on site-specific conditions. The retained technologies were then assembled into remedial alternatives to meet removal action objectives. The assembled remedial alternatives for remediating soils at Site 15 at NAS Alameda were as follows:

Alternative 1 - No Action

Alternative 2 - Excavation, On-Site Washing, and On-Site Disposal

Alternative 3 - Excavation, On-Site Solidification or Stabilization, and On-Site Disposal

Alternative 4 - Excavation, On-Site Solvent Extraction and Stabilization or On-Site Solvent Extraction and Acid Washing, and On-Site Disposal

Alternative 5 - Excavation and Off-Site Incineration

Alternative 6 - Excavation and Class I Disposal With or Without Pretreatment

Each alternative was then evaluated in detail to identify a preferred remedial alternative based on overall effectiveness; technical and administrative implementability; and estimated capital, operations, and maintenance costs. Alternative 4B (Excavation, On-Site Solvent Extraction and Acid Washing, and On-Site Disposal) is the preferred remedial alternative for conducting the removal action at Site 15 at NAS Alameda.

1.0 INTRODUCTION

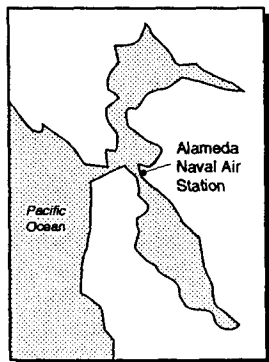
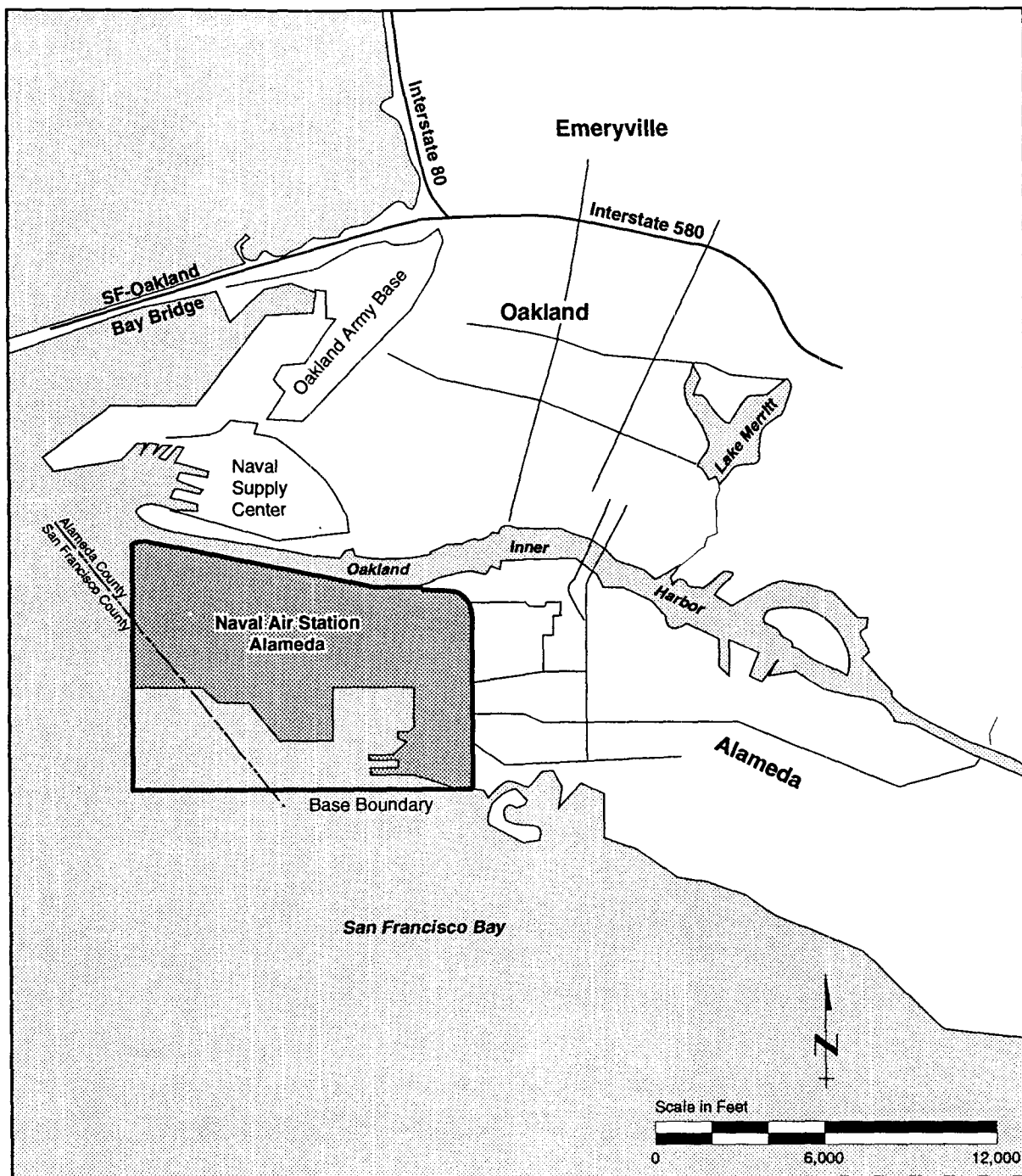
PRC Environmental Management, Inc. (PRC) received Contract Task Order (CTO) No. 0258 from the Department of the Navy, Western Division, Naval Facilities Engineering Command (WESTDIV), under Comprehensive Long-term Environmental Action Navy (CLEAN) Contract No. N62474-88-D-5086 on November 19, 1993. The Navy statement of work, dated November 8, 1993, calls for PRC to prepare documents required for a removal action to address vadose zone soils with elevated polychlorinated biphenyl (PCB) and lead levels at Installation Restoration Program (IRP) Site 15 at Naval Air Station (NAS) Alameda, California (Figures 1-1 and 1-2). The Navy has determined that a removal action is appropriate at Site 15 based on the following factors established in the Code of Federal Regulations Title 40 Part 300.415(b)(2) (40 CFR 300.415[b][2]).

- (i) Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances, pollutants, or contaminants
- (iv) High levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface that may migrate
- (v) Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released

The removal action will focus on reducing the existing risk to human health and the environment by removing surface soils with elevated PCB and lead concentrations.

WESTDIV requested that PRC review previous results, conduct additional site investigations, and develop an engineering evaluation/cost analysis (EE/CA) report to implement the removal action. This EE/CA report evaluates the extent of PCB and lead contamination, identifies removal action objectives, screens general response actions and technologies, develops and evaluates potential removal action alternatives, and recommends a preferred alternative to accomplish removal action objectives at Site 15.

PRC and its CLEAN team subcontractor, Montgomery Watson (referred to collectively as the PRC team), prepared this EE/CA report. Montgomery Watson has primary responsibility for development of the EE/CA report; PRC provides project management and technical oversight.



Source: Modified from CA State Automobile Assoc. map, Oakland/Berkeley/Alameda. Copyright 1980, revised 1989.

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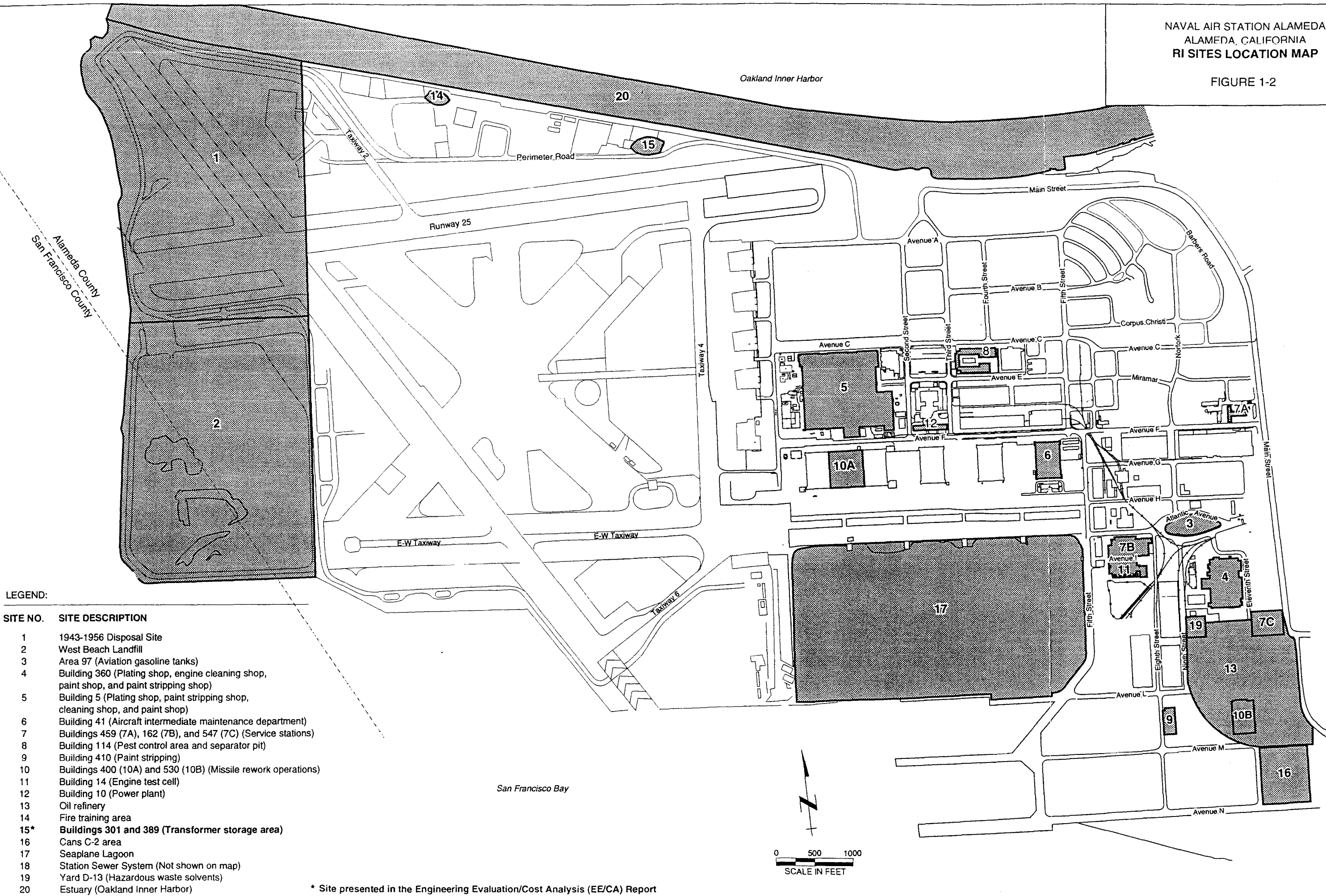
**NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA**

**REGIONAL LOCATION MAP OF
NAS ALAMEDA**

FIGURE 1-1

FIGURE 1-2

A-6



2.0 SITE CHARACTERIZATION AND OBJECTIVES

This section describes Site 15 at NAS Alameda, including background; current use; results of previous and current site investigations; nature, source, and extent of contamination; potential or actual impacts on surrounding populations; justification of removal action; and removal action objectives.

2.1 SITE DESCRIPTION AND BACKGROUND

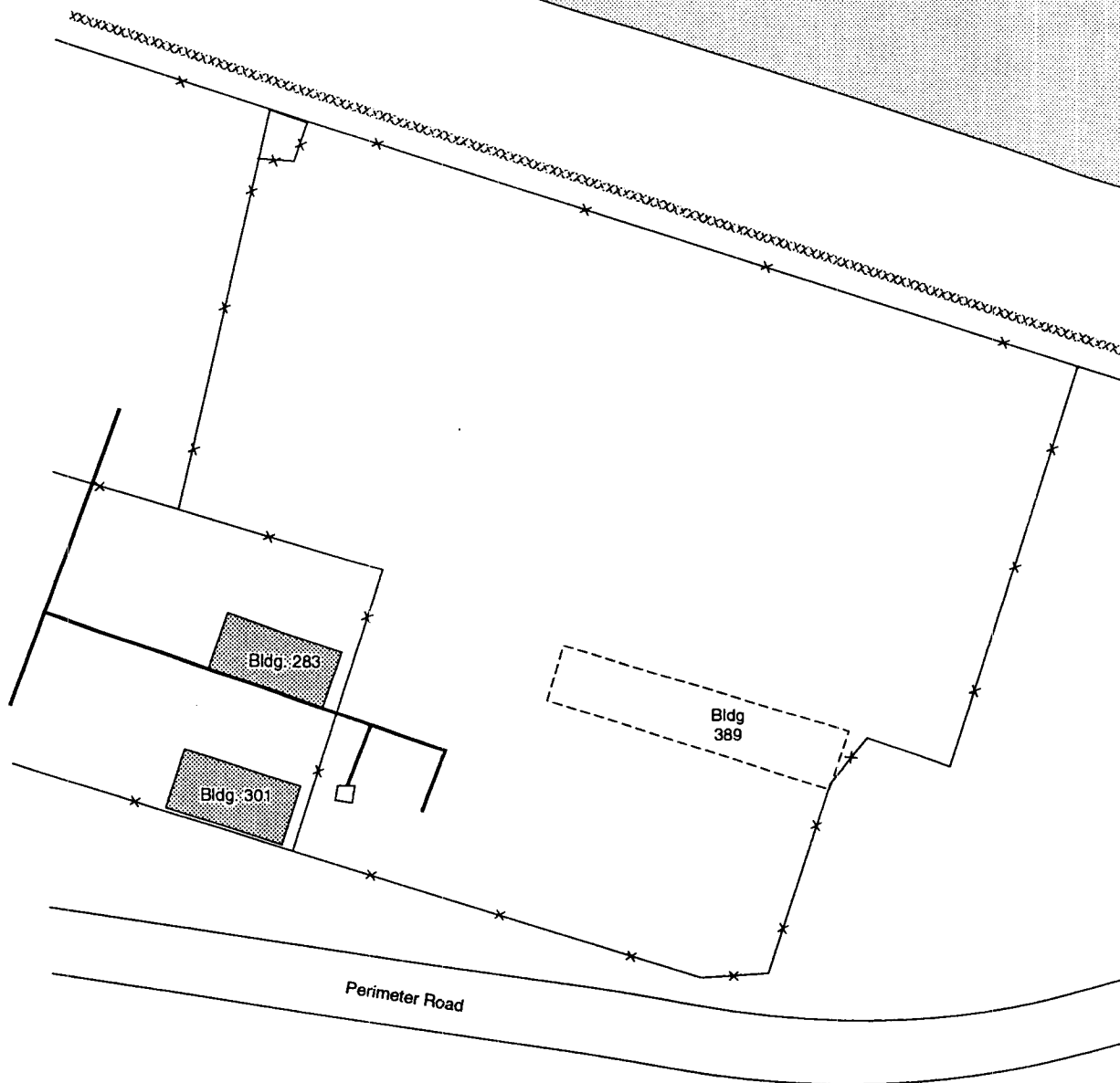
Site 15 consists of Building 283, Building 301, the concrete foundation of former Building 389, and the associated yards of all three buildings. The site is located north of Runway 7-25 and Perimeter Road, approximately 250 feet south of the Oakland Inner Harbor (Figure 2-1). The initial assessment study (IAS) site reference number previously used for this site was IAS-5.

The Navy constructed these quonset huts at Site 15 in the 1950s. Building 301 was used for storage of electrical equipment, oil-filled transformers, and old, unused machinery. Before Building 389 was torn down (the concrete slab is still in place), it stored transformers (Canonie Environmental [Canonie] 1990). During a site visit conducted in March 1988, Canonie personnel noted that several 55-gallon drums of hydraulic fluid were stored in Building 301 and that surface soils around Building 301 were discolored.







Prior to 1974, transformers were stored on bare ground in the vicinity of Buildings 283, 301, and 389. According to personnel familiar with site operations, an estimated 200 to 400 gallons of oil containing PCBs from transformers may have been stored at any one time. Personnel also recalled occasional leaks of the PCB-containing oil. However, the PCB-containing oil was also drained from the transformers on a regular basis and used to spray the grounds around the nearby buildings for weed control before regulations were promulgated restricting this use (Ecology and Environment, Inc. [E&E] 1983).



OAKLAND INNER HARBOR



LEGEND:

-  Catch Basin
-  Storm Sewer Line
-  Building
-  Former Building
-  Fence
-  Elevated Berm

Notes:
Base map CAD File provided by NAS Alameda

0 30 60
SCALE IN FEET

NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITE MAP
SITE 15

FIGURE 2-1

01/94.AL

2.2 CURRENT USE

The NAS Alameda base fire department currently uses Buildings 283 and 301, located at the southwest corner of Site 15, for storage of equipment. The area around both buildings is fenced. The remainder of the site consists of the foundation of Building 389 and an empty lot, and is used as a storage yard by one of the base maintenance groups. The entire site is enclosed by an approximately 8-foot-high, chain-link fence, with posted signs stating "Warning - PCB Contamination in Surface Soil - Unauthorized Personnel Prohibited."

2.3 RESULTS OF PREVIOUS INVESTIGATIONS

This section summarizes the analytical results from previous site investigations performed by Wahler Associates (Wahler) and the PRC team at Site 15.

2.3.1 NACIP Program Investigation

Surface soil sampling during the verification step of the Navy Assessment and Control of Installation Pollutants (NACIP) program was conducted by Wahler in 1985. Twelve surface soil samples were collected north of the Building 389 concrete foundation. The samples were analyzed for PCBs only. The highest PCB concentration detected was 3 milligrams per kilogram (mg/kg) (Canonie 1990; Wahler 1985).

2.3.2 IR Program Remedial Investigation

The remedial investigation (RI) conducted in 1992 by the PRC team at Site 15 included surface geophysics, surface soil sampling, drilling of soil borings, subsurface soil sampling, installation and sampling of monitoring wells, in situ permeability testing, and groundwater level measuring (PRC and JMM 1992).

2.3.2.1 Site Geology and Hydrogeology

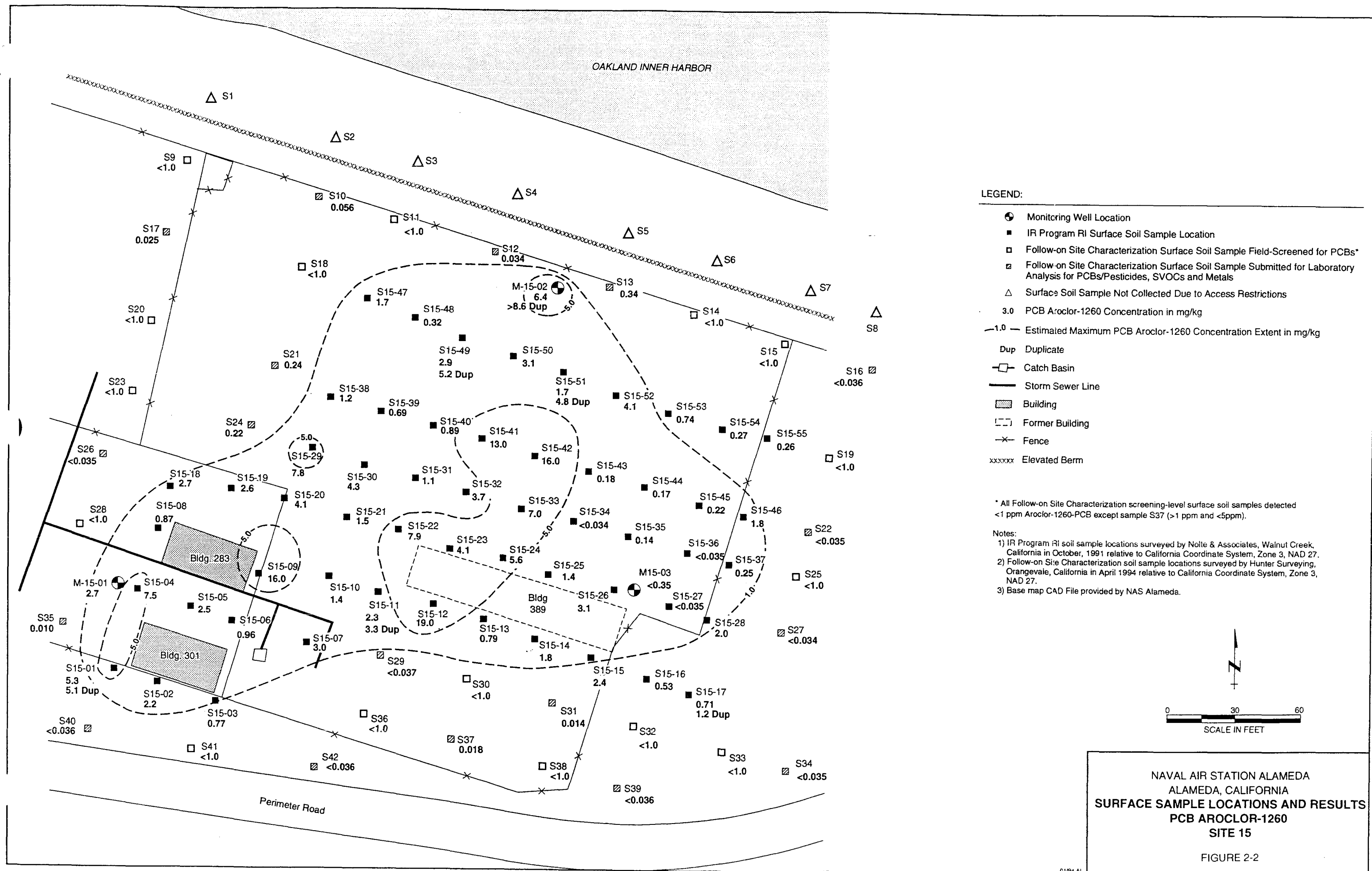
Material underlying Site 15 can be divided into two groups: fill material and native sediments. Fill material underlies the site from ground surface to approximately 12 to 13 feet below ground surface (bgs). The fill material consists of interbedded fine-grained, well-sorted sands (SP), moderately well-sorted silty to clayey sands (SC), and clays (CL). The native sediments consist of sandy-silty clay (SC) and clayey sand to clay (CL). The native sediments are believed to be Holocene Bay Mud. The average depth to groundwater was 3.7 feet bgs, and ranged from 2.5 to 5.2 feet bgs.

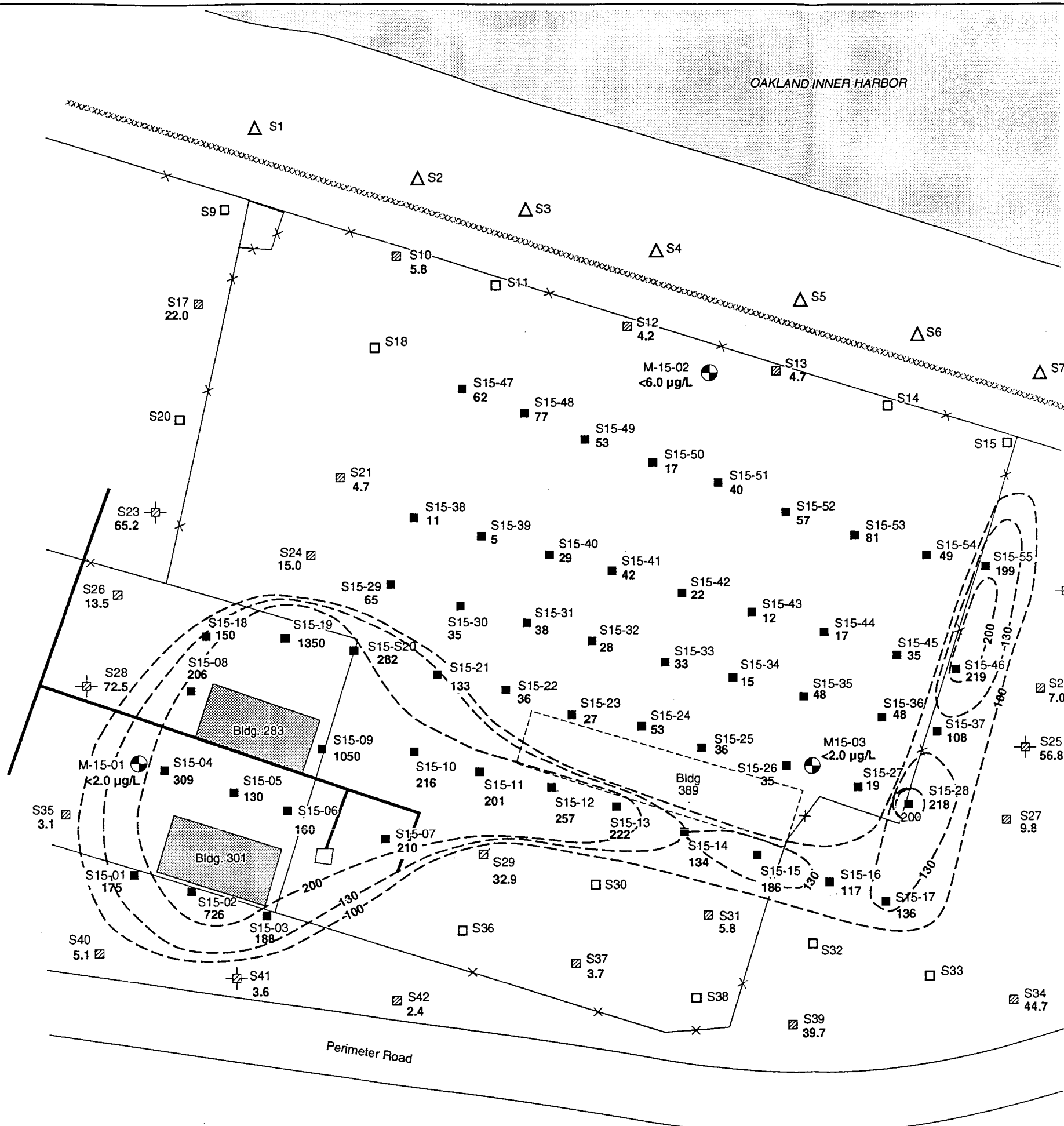
2.3.2.2 Analytical Results

Surface soil samples collected at Site 15 contained moderate levels of PCBs and lead, and low levels of pesticides, semivolatile organic compounds (SVOC), and metals. PCB Aroclor-1260 was detected in 58 of 61 surface soil samples collected (Figure 2-2). Concentrations detected in surface samples ranged from 0.140 mg/kg to 19.0 mg/kg. Lead concentrations detected in surface soil samples ranged from 5 mg/kg to 1,350 mg/kg (Figure 2-3). Subsurface soil samples were collected at depths of 2.0, 8.0, and 12.0 feet bgs and analyzed for PCBs/pesticides, volatile organic compounds (VOC), SVOCs, and metals. At depths greater than or equal to 2.0 feet bgs, PCBs/pesticides were not detected, and lead was detected only at concentrations less than 10 mg/kg. Low levels of VOCs, SVOCs, and metals were detected in surface and subsurface soil samples. Analytical results also indicate that no PCBs/pesticides, VOCs, SVOCs, or lead have been detected in the groundwater.

2.4 CURRENT SITE INVESTIGATION

Surface soil sampling was conducted by the PRC team on December 28, 1993 to delineate the extent of PCBs and lead in surface soil at Site 15 (PRC and Montgomery Watson 1994). The sampling program was conducted in two phases in which initial field screening samples were collected and analyzed for PCBs in the field to estimate the extent of PCBs. Based on the field screening results, final confirmation samples were selected for PCB analysis and the results used to assess the lateral extent of PCBs in surface soil. In addition, selected final confirmation samples were also analyzed to evaluate the extent of lead in surface soil that may require remediation.



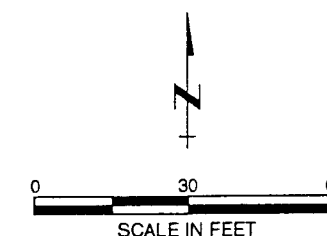


LEGEND:

- Monitoring Well Location
- IR Program RI Surface Soil Sample Location
- Follow-on Site Characterization Surface Soil Sample Location
- ▣ Follow-on Site Characterization Surface Soil Sample Submitted for Laboratory Analysis for Metals (Including Lead)
- ⊕ Additional Follow-on Site Characterization Sample Submitted for Laboratory Analysis for Lead Only
- △ Surface Soil Samples Not Collected Due to Access Restrictions
- 150 Lead Concentration* (mg/kg) (Surface)
* at 2.0 ft. bgs, lead <10 mg/kg
- 100 Estimated Maximum Lead Concentration Extent in mg/kg
- ☐ Catch Basin
- Storm Sewer Line
- ▨ Building
- ▤ Former Building
- Fence
- xxxxxx Elevated Berm

Notes:

- 1) IR Program RI soil sample locations surveyed by Nolte & Associates, Walnut Creek, California in October, 1991 relative to California Coordinate System, Zone 3, NAD 27.
- 2) Follow-on Site Characterization soil sample locations surveyed by Hunter Surveying, Orangevale, California in April 1994 relative to California Coordinate System, Zone 3, NAD 27.
- 3) Base map CAD File provided by NAS Alameda.



NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SURFACE SAMPLE LOCATIONS AND RESULTS
TOTAL LEAD
SITE 15

FIGURE 2-3

2.4.1 Field Screening Sampling and Analytical Results

Thirty-four surface soil samples were collected from Site 15 in a gridded pattern, as shown on Figure 2-2. Soils were collected from a depth of 6 inches bgs using a stainless steel sleeve, either hand driven or hand augered. A soil sample was then extracted from the most undisturbed portion (bottom) of the stainless steel sleeve and analyzed for PCBs using the Enviro Gard™ test kit (PRC and Montgomery Watson 1994). Field screening results for PCBs indicated that all samples were screened below 1.0 mg/kg for Aroclor-1260 except for sample S15-S37, which was screened between 1.0 mg/kg and 5.0 mg/kg for Aroclor-1260. As discussed below, all final confirmation sample results indicated that PCB Aroclor-1260 concentrations were below 1.0 mg/kg, including those for sample S15-S37.

2.4.2 Final Confirmation Sampling and Analytical Results

Based on PCB results from previous investigations and from the field screening samples, the PRC team collected and submitted 18 final confirmation soil samples for laboratory analysis of PCBs/pesticides, SVOCs, and metals (Figures 2-2 and 2-3). Five additional final confirmation samples were collected and submitted for laboratory analysis of lead only (Figure 2-3).

The data validation report and laboratory results for the final confirmation samples are presented in Appendix A. Based on results from previous investigations and from the final confirmation samples, the extent of PCBs and lead in surface soil at Site 15 was successfully delineated. The final confirmation sampling data indicated that PCB Aroclor-1260 concentrations detected ranged from 0.010 mg/kg to 0.340 mg/kg (Figure 2-2). Lead concentrations detected are shown on Figure 2-3 and ranged from less than 1 mg/kg to 72.5 mg/kg.

2.5 NATURE, SOURCE, AND EXTENT OF CONTAMINATION

Analytical data from the site characterization indicate that the shallow vadose zone soil contains elevated levels of PCBs and lead that may pose risk to human health and the environment. PCBs are organic compounds in which chlorine atoms replace two or more hydrogen atoms on a biphenyl molecule. PCBs are very stable, have low vapor pressures, low flammability, high heat capacity, and

low electrical conductivity. Commercial production of PCBs began in the 1920s under the trade name Aroclor. PCB Aroclor products are characterized by four-digit code numbers. The first two digits indicate the type of molecule (for example, 12 indicates biphenyl) and the last two digits indicate the percentage of chlorine in the mixture by weight. In general, PCBs with fewer chlorine atoms are more soluble, more flammable, and less persistent in the environment than those PCBs with more chlorine atoms (McCoy and Associates, Inc. 1992). Aroclor-1260 is the PCB isomer predominantly found in soil at Site 15; its source is past storage of transformers containing PCB-oil, as described in Section 2.1.

Lead is a naturally occurring metal found in the earth's crust. The metal is found in air, soil, water, and plants. Lead is primarily used commercially for the manufacture of batteries; however, other uses include additives for gasoline, ammunition, and other metal products. The source of elevated levels of lead in Site 15 soils is unknown. However, a potential source of lead may be the lead paint applied to buildings at the site. The distribution of elevated lead concentrations correlates with the footprints of the buildings at Site 15.

PCBs are regulated under the Toxic Substances Control Act (TSCA) and the Resource Conservation and Recovery Act (RCRA). TSCA requires that material contaminated with PCBs at concentrations of 50 mg/kg or greater be disposed of in an incinerator or by an alternative method that achieves a level of performance equivalent to incineration. Soils contaminated above 50 mg/kg may also be disposed of in a chemical waste landfill. However, based on the analytical results (Sections 2.3 and 2.4), Site 15 soil is not anticipated to require disposal under TSCA.

According to RCRA (40 CFR 261) PCBs alone are not a hazardous waste; however, if the PCBs are mixed with RCRA hazardous waste they can be subject to land disposal restrictions (LDR) set forth in 40 CFR 268 as follows. PCBs are addressed by the LDRs under the California List Wastes. Under this subsection, nonliquid hazardous wastes containing halogenated organic compounds (HOC) in total concentrations greater than or equal to 1,000 mg/kg are prohibited from land disposal. PCBs are included in the list of HOCs provided in the regulation (Appendix III Part 268).

According to 40 CFR 261, waste is characterized as hazardous by toxicity if the leachable lead concentrations is greater than 5.0 milligrams per liter (mg/L) based on toxicity characteristic leaching

procedures (TCLP). Under California Code of Regulations, Title 22, Section 66261.24(a)(2)(b) (CCR §22-66261.24[a][2][b]), waste is characterized as hazardous if it contains PCBs at concentrations exceeding the total threshold limit concentration (TTLC) of 50 mg/kg or lead at concentrations exceeding the TTLC of 1,000 mg/kg. A waste is also hazardous if it contains extractable PCB concentrations exceeding the soluble threshold limit concentration (STLC) of 5.0 mg/L or lead concentrations exceeding the STLC of 5.0 mg/L. The extractable concentrations are determined by performing the waste extraction test (WET) on samples of the waste. However, WET is to be used only to determine whether a waste is hazardous if the value of the total concentration of lead (in mg/kg) is greater than the STLC value and less than the TTLC value.

TCLP or WET tests have not been conducted on soil at Site 15. However, based on the results of previous and current site investigations, Site 15 soil may be characterized as RCRA hazardous waste based on potential leachability of lead. For the purpose of this removal action, the soil is assumed to be RCRA hazardous.

The estimated extent of PCB contamination in the vadose zone soil at Site 15 was characterized and is shown on Figure 2-2. For consistency, designated soil sample results were used in determining the extent of PCBs in the soil. Duplicate results were used to evaluate the consistency of PCB results from the soil sampling location. PCB concentrations at or above 1.0 mg/kg encompass an area of approximately 45,000 square feet. PCB contamination at or above 5.0 mg/kg is located in four localized areas encompassing approximately 7,000 square feet total. The lateral extent of soil containing lead at greater than 100 mg/kg, 130 mg/kg, and 200 mg/kg is reflected by areas of approximately 24,000 square feet, 17,000 square feet, and 13,000 square feet, respectively, as shown on Figure 2-3. As discussed in Section 2.3.2, subsurface soil samples (collected at 2.0 feet bgs) contained levels of PCBs below detection limits (0.040 mg/kg) and lead at concentrations less than 10 mg/kg. In addition, analytical results indicate that no PCBs or lead have been detected in the groundwater. Therefore, results of the site characterization indicate that the extent of elevated PCB and lead concentrations are limited to vadose zone soil at depths less than 2.0 feet bgs.

2.6 POTENTIAL OR ACTUAL IMPACTS ON SURROUNDING POPULATIONS

Although the PCB- and lead-contaminated soil at Site 15 does not appear to have affected groundwater to date, the potential impact to groundwater is uncertain. As stated in Section 2.3.2.1 - Site Geology and Hydrogeology, the depth to groundwater at Site 15 ranges from 2.5 to 5.2 feet bgs; the average depth to groundwater is 3.7 feet bgs. PCBs are generally considered persistent and fairly immobile. However, PCBs may affect the shallow groundwater at Site 15. In addition, elevated concentrations of lead in the soil may also affect groundwater over time..

Release of PCBs or lead to the Oakland Inner Harbor is unknown. Based on existing information, the Navy believes that PCBs and lead have not affected the Oakland Inner Harbor because an elevated berm lies between Site 15 and the harbor, and because PCBs and lead have not been detected in the groundwater at this site. However, PCBs and lead could affect the Oakland Inner Harbor through site groundwater or surface water migration because the site groundwater level is shallow and the site is close to the Oakland Inner Harbor. At present, no work has been performed in the vicinity of Site 15 to identify potential ecological receptors that inhabit the Oakland Inner Harbor. However, an ecological assessment has been drafted under the RI/feasibility study (FS) for NAS Alameda.

Exposure to humans is possible because the PCBs and lead are concentrated in the surface soil (less than 2 feet). Airborne exposure pathways may be important due to potential exposure to fugitive dust by base personnel using the running path adjacent to the site.

2.7 JUSTIFICATION OF REMOVAL ACTION

Paragraph (b)(2) of Section 300.415 of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) lists factors that should be considered when determining the appropriateness of a removal action. The following factors have been identified as applicable for the removal action at Site 15 at NAS Alameda:

- (i) Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants

- (iv) High levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface that may migrate
- (v) Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released

The previous and current investigations have been used to characterize the contamination associated with Site 15. A removal action is justified because PCBs and lead have been released into the environment meeting Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) § 104 criteria for response action and the previously mentioned removal factors in 40 CFR 300.415 have been met. A removal response is further justified because (1) elevated levels of PCBs and lead were detected in surface soils; (2) base personnel work in the area; (3) site groundwater is shallow; (4) surface transport of soil could carry PCBs and lead off site; and (5) Site 15 is near the Oakland Inner Harbor.

2.8 REMOVAL ACTION OBJECTIVES

The removal action objectives at Site 15 are to mitigate the risk to human health and the environment caused by the potential for exposure to soils with elevated PCB and lead levels, and to reduce the potential impacts of soil contaminants on the groundwater. To address these objectives, the Navy proposes to remediate vadose zone soils with PCB concentrations at or above 1.0 mg/kg and lead levels at or above 130 mg/kg at Site 15. The proposed cleanup level of 1.0 mg/kg for PCBs is considered by the U.S. Environmental Protection Agency (EPA) as that level which would not pose an unacceptable human health risk under a residential scenario considering ingestion, inhalation, and dermal contact exposure pathways (USEPA 1990). The 1.0 mg/kg cleanup level is a preliminary remediation goal for sites where unlimited exposure under residential land use is assumed. The 1.0 mg/kg level reflects a protective, quantifiable concentration for soil. Lower concentrations are not generally quantifiable and in many cases will be below background concentrations. A concentration of 1.0 mg/kg is generally the starting point for analysis at PCB-contaminated Superfund sites where land use is residential. The proposed cleanup goal of 130 mg/kg for lead is the default value used by the California EPA (Cal-EPA) Department of Toxic Substances Control (DTSC). The final DTSC Preliminary Endangerment Assessment Guidance Manual (DTSC 1994) states in Section 2.5.1.3 - Chemical Groups, Inorganic Lead (page 2-19) that:

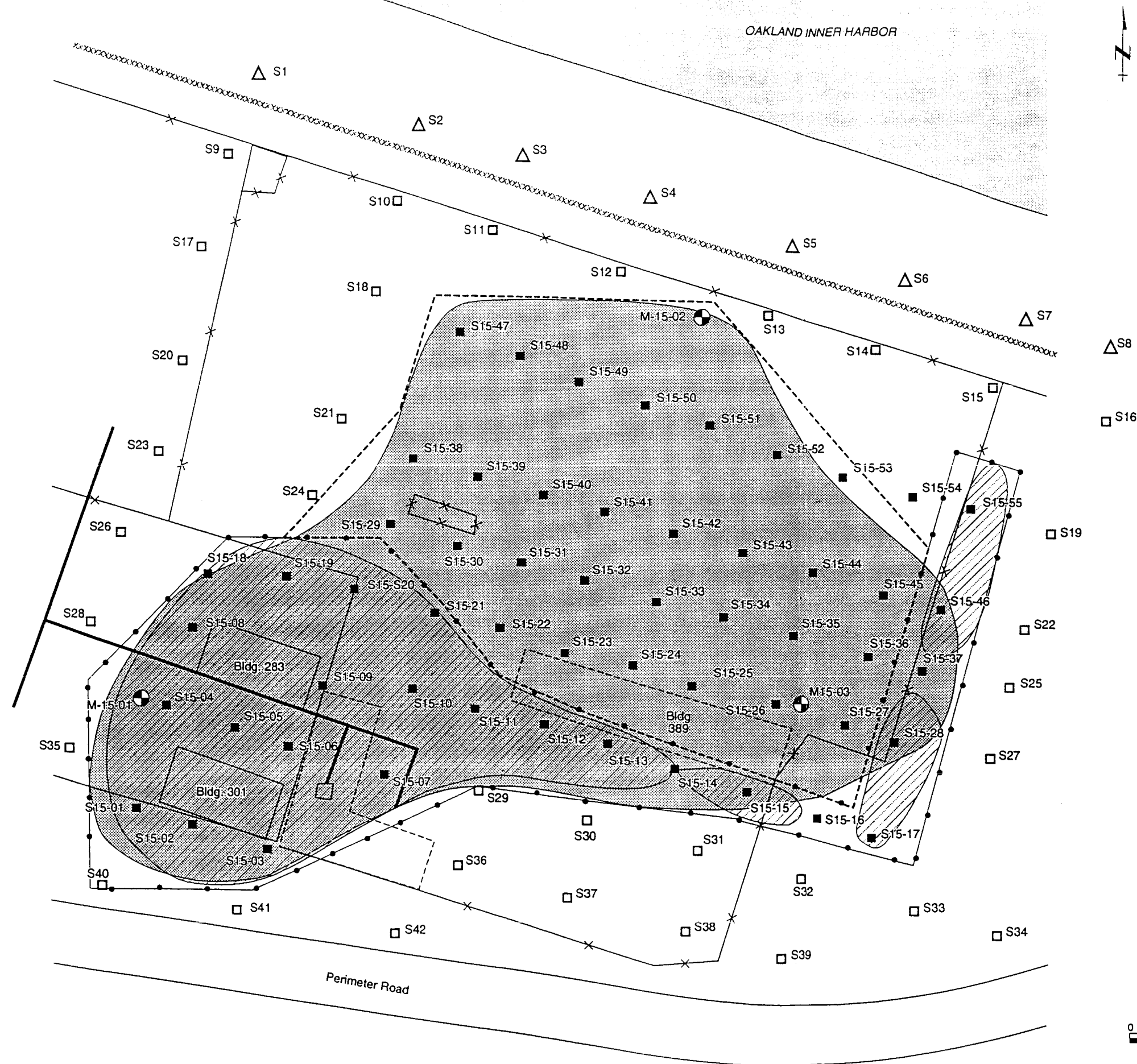
For screening purposes, the Office of Scientific Affairs (OSA) has established that inorganic lead concentrations less than 130 ppm [parts per million] in soil constitute an acceptable health risk. This value was obtained using the spreadsheet model LEADSPREAD, which is described in guidance from OSA (DTSC 1992, Chapter 7) and conservative, screening level assumptions.

The proposed cleanup goals of 1.0 mg/kg for PCBs and 130 mg/kg for lead are interim cleanup goals for purposes of this removal action and are not the final cleanup levels for Site 15. The final cleanup goals will be based on the human health and ecological risk assessment to be conducted during the RI/FS. The risk assessment will be developed based on the residual concentrations remaining at the site after removal action activities are complete. Figure 2-4 shows the estimated extent of soil remediation for the proposed interim cleanup goals. The estimated vertical depth of remediation is 2.0 feet and the resulting estimated volume of soil is approximately 3,700 cubic yards. As shown on Figure 2-4, the extent of vadose zone soil containing PCBs at or above 1.0 mg/kg generally encompasses vadose zone soil containing lead at or above 130 mg/kg.

2.9 DETERMINATION OF REMOVAL SCHEDULE

The following removal schedule is proposed for Site 15 at NAS Alameda.

<u>Action</u>	<u>Estimated Date</u>
Submitted Draft EE/CA for Agency and Public Review	April 15, 1994
Public Notice for Draft EE/CA	April 19, 1994
Began Removal Activities at Site 15 (Site Preparation Activities Only)	May 20, 1994
Submitted Draft Implementation Work Plan for Agency Review	June 3, 1994
Submit Final EE/CA	August 12, 1994
Submit Final Action Memorandum for Agency and Public Review	August 12, 1994
Public Notice for Final Action Memorandum	August 19, 1994

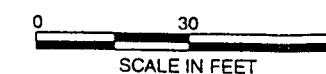


LEGEND:

- Monitoring Well Location
- IR Program RI Surface Soil Sample Location
- Follow-on Site Characterization Surface Soil Sample Location
- △ Surface Soil Samples Not Collected Due to Access Restrictions
- - - Estimated Extent of Excavation of Soil Containing PCBs
- - - Estimated Extent of Excavation of Soil Containing PCBs and Lead
- ▨ PCB Aroclor-1260 Concentrations Above 1.0 mg/kg
- ▩ Lead Concentrations Above 130 mg/kg
- ⊞ Catch Basin
- Storm Sewer Line
- Fence
- xxxxx Elevated Berm

Notes:

- 1) IR Program RI soil sample locations surveyed by Nolte & Associates, Walnut Creek, California in October, 1991 relative to California Coordinate System, Zone 3, NAD 27.
- 2) Follow-on Site Characterization soil sample locations surveyed by Hunter Surveying, Orangevale, California in April 1994 relative to California Coordinate System, Zone 3, NAD 27.
- 3) Base map CAD File provided by NAS Alameda.



NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
ESTIMATED EXTENT OF SOIL REMEDIATION
SITE 15

FIGURE 2-4

0694.AL

Submit Final Implementation Work Plan

August 24, 1994

Finish Removal Activities at Site 15

March 6, 1995

Submit Draft Implementation Report for
Agency and Public Review

May 18, 1995

Submit Final Implementation Report

August 7, 1995

Public notice of the action memorandum will consist of a one-page newsletter distributed to the public describing the preferred remedial alternative at Site 15. The action memorandum substantiates the need for a removal action based on the NCP criteria and documents consideration of the factors affecting the removal decision. It will contain a concise written record of the decision process and rationale leading to the selection of a removal action. The implementation work plan will be prepared for the removal and subsequent treatment and disposal of any soil containing PCBs and lead at levels above the PCB and lead cleanup goals for this removal action. The implementation report will summarize the removal activities and the results of the confirmation sampling and analysis.

3.0 IDENTIFICATION AND SCREENING OF GENERAL RESPONSE ACTIONS AND TECHNOLOGIES

To achieve the removal action objectives, site-specific data from the site characterization were reviewed so that potential alternatives for this removal action could be identified, developed, and evaluated. The removal action alternative development and evaluation process proceeded as follows. First, applicable general response actions and technologies were identified and screened with respect to site-specific data. Second, technologies retained for further analysis from the initial screening were then assembled into alternatives, which are comprehensive removal action plans incorporating one or more specific technologies related to soil remediation. Third, the alternatives were evaluated for effectiveness, implementability, and cost and compared to identify a preferred alternative. This section describes the response actions and treatment technologies that were identified and screened for this removal action. The removal action alternatives are developed and evaluated in Section 4.0.

3.1 IDENTIFICATION AND SCREENING OF GENERAL RESPONSE ACTIONS

General response actions describe those actions that will satisfy the removal action objectives described in Section 2.8. General response actions for the removal action at Site 15 at NAS Alameda have been identified and are discussed below. Table 3-1 summarizes the screening of the general response actions identified.

3.1.1 No Action

The no-action response does not entail remediation of soil at or in the vicinity of the site. This action includes only ongoing monitoring and reporting. As stated in the NCP, the no-action scenario is required to be retained through the remedial evaluation process; therefore, this general response action is retained for further consideration.

3.1.2 Institutional Actions

Institutional response actions involve only access and deed restrictions for the site. Institutional actions alone, such as perimeter fencing, generally provide minimal protection to human health and

**GENERAL RESPONSE ACTION AND TECHNOLOGY SCREENING SUMMARY
SITE 15 FORMER TRANSFORMER STORAGE AREA
NAS ALAMEDA**

General Response Action	Remedial Technology Processes	Effectiveness	Implementability	Relative Cost	Initial Screening Decision	Comments
No Action	No Action	Low	Good	Low	Consider	Serves as baseline, contaminants remain indefinitely
Institutional Controls	Deed Restrictions	Low	Good	Low	Eliminate	Minimal protection to human health and the environment, not permanent soil remediation solution.
	Fencing	Low	Good	Low	Eliminate	
Containment Actions	Capping	Low	Good	Low	Eliminate	These actions prevent exposure and further migration; however, they provide only limited protection to human health and the environment and limit future land use.
	Vertical Barriers	Low	Moderate	Moderate	Eliminate	
	Horizontal Barriers	Low	Moderate	Moderate	Eliminate	
	Surface Controls	Low	Good	Low	Eliminate	
Removal/Disposal Actions	Excavation	High	Good	Moderate	Consider	Effective, easy to implement
	On-Site Backfill	Moderate	Moderate	Low	Consider	Community resistance
	Class I Disposal	High	Good	High	Consider	Can pretreat for lead and PCBs prior to disposal
	Class II Disposal	Moderate	Difficult	Moderate	Eliminate	Case by case acceptance of waste
	Class III Disposal	Low	Difficult	Low	Eliminate	Soils do not meet stringent facility acceptance criteria
	Recycler	Low	Difficult	Low	Eliminate	Lead and PCB concentrations too high for acceptance
In Situ Actions	Solidification/Stabilization	Moderate	Difficult	Low	Eliminate	Not feasible for shallow soil (<2 ft bgs)
	Aerobic Bioremediation	Low	Moderate	Moderate	Eliminate	Not proven effective for all PCBs, not effective for lead
	Anaerobic Bioremediation	Low	Difficult	Moderate	Eliminate	Not feasible in shallow soil (<2 ft bgs) nor for lead
	Vitrification	High	Difficult	Very High	Eliminate	Complex technology, very high costs
Ex Situ Actions	Soil Washing	Moderate	Moderate	Moderate	Consider	Effective for removing lead and potentially PCBs
	Acid Washing	Moderate	Moderate	Moderate	Consider	Effective for removing lead, not effective for PCBs
	Solvent Extraction	Moderate	Moderate	Moderate	Consider	Effective for removing PCBs and potentially lead
	Controlled Solid-phase Biotreatment	Low	Difficult	Low	Eliminate	Not effective for lead, lead toxic to microbes
	White-rot Fungus	Low	Difficult	Moderate	Eliminate	Not proven technology, not effective for lead
	Solidification/Stabilization	Moderate	Moderate	Low	Consider	Immobilizes lead, may immobilize PCBs
	Chemical Dechlorination	Low	Difficult	High	Eliminate	Effective for PCBs, not effective for lead
	Ultrasonic Detoxification	Low	Difficult	High	Eliminate	Not proven technology, not effective for lead
	Incineration	Moderate	Good	High	Consider	Proven for PCBs, lead remains in ash, very high costs
	Thermal Desorption	Moderate	Difficult	Moderate	Eliminate	Proven for PCBs not lead, difficult for site-specific soil
	Pyroplasmic™	Low	Difficult	High	Eliminate	Not effective for solid wastes or lead

Bold entries indicate remedial technology retained for the development of remedial alternatives.

the environment and are not considered permanent soil remediation solutions. Therefore, institutional actions are eliminated from further consideration.

3.1.3 Containment Actions

Containment actions provide physical containment of chemicals of concern in the affected media to prevent exposure and further migration. Containment actions, such as capping, slurry walls, and grout curtains, may be cost-prohibitive for large areas of contamination. Containment remedies require long-term land use or exposure restrictions to maintain their protectiveness. Furthermore, containment provides only limited protection to human health and the environment and would not be suitable for land reuse. Therefore, containment actions are eliminated from further consideration.

3.1.4 Removal and Disposal Actions

Removal and disposal actions involve physical removal and disposal of the contaminated soil. These actions can provide the highest degree of protection of human health and the environment by removing the source of contamination. Removal and disposal actions may be cost-prohibitive if large volumes of soil require remediation prior to disposal. In addition, the Navy may be liable in the future for its landfilled waste. However, these response actions are feasible and easy to implement; therefore, they are retained for further consideration.

3.1.5 In Situ Treatment Actions

In situ treatment actions involve treatment of the soil without physical removal. Because these actions provide a high degree of contaminant removal and destruction of chemicals, a high degree of protection of human health and the environment would be attained. Although in situ actions are generally less reliable than removal and disposal actions, these actions may be cost-effective when large volumes of soil require remediation. However, as discussed in Section 3.2.3, these treatment technologies are eliminated primarily because they are not effective for PCBs or lead or cannot be used in shallow soils.

3.1.6 Ex Situ Treatment Actions

Ex situ treatment actions involve treatment of the soil after it has been physically removed. Like in situ treatment actions, these actions can provide a high degree of contaminant removal or destruction of chemicals, and thus provide a high degree of protection of human health and the environment. Ex situ actions are retained for further analysis.

3.2 IDENTIFICATION AND SCREENING OF TREATMENT TECHNOLOGIES

Potentially applicable technology process options were compiled for each general response action retained for this soil removal action. The technology process options were screened to retain implementable technologies that can be used in the development of remedial alternatives. The screening was based on the relative effectiveness, technical and institutional implementability, and preliminary cost for each technology type and process option. A summary of this screening is presented on Table 3-1. The last two columns of the table indicate whether the process option will be retained for further evaluation, and includes comments regarding elimination or consideration of the technology or process option.

3.2.1 No Action

For this general response action, only long-term soil and groundwater monitoring will be required. This action is generally retained to serve as a baseline for comparison with other removal action alternatives during the detailed analysis; therefore, it will be considered for further evaluation.

3.2.2 Removal and Disposal Actions

Removal and disposal actions consist of physical removal and disposal of untreated or treated soils on site or at an off-site facility. Any excavated soil, whether treated or untreated, will require proper disposal. Chemical analysis would be required at the time of soil excavation to establish whether treatment is necessary pursuant to the LDRs set forth in 40 CFR 268 and in CCR §22-66268. Section 2.5 discusses the California-hazardous levels for PCBs and lead and the disposal regulations under TSCA, RCRA, and CCR.

California non-RCRA waste may be subject to treatment standards pursuant to the LDRs. In April 1992, the Governor of California signed into law Senate Bill (SB 611, Chapter 33 of the 1992 Statute), a bill extending the effective date to January 1, 1993, of treatment standards for solid hazardous waste containing metals (for example, lead). In August 1992, a subsequent bill, SB 1726 (Chapter 853 of the 1992 Statute), further extended the deadline for wastes addressed in the earlier bill, but also for some additional wastes. SB 1726 extended the prohibition date to January 1, 1995 for non-RCRA solid hazardous waste containing metals (for example, lead) and for non-RCRA hazardous wastes whose treatment standards are based on incineration, solvent extraction, or biological treatment (for example, PCB-containing waste). Therefore, land disposal of Site 15 soil containing PCBs and lead may become difficult in the near future.

The applicable technologies for these options are identified and screened below.

3.2.2.1 Excavation

Excavation of soil at Site 15 would involve the use of general earthwork equipment. Before excavating soil, site preparation activities would be conducted, including demolishing Buildings 283 and 301, clearing vegetation, decommissioning utilities, removing site fencing, destroying monitoring wells, and performing preliminary earthwork necessary for excavation. Since the excavation depth is not anticipated to be greater than 2 feet, sloping or shoring would not be required in accordance to California Occupational Safety and Health Administration (OSHA) regulations 1540 and 1541.

Excavation alleviates contaminant mobility at the site and is easy to implement. However, no long-term effectiveness or permanence is achieved without additional treatment. During excavation, the removal action may pose a potential health and safety risk to site workers through skin contact and air emissions. However, these risks can be mitigated with the use of appropriate health and safety controls (for example, personal protective equipment [PPE]). Excavation is considered feasible and is retained for further consideration.

3.2.2.2 On-Site Disposal

On-site disposal options include backfilling into the excavation area or potential reuse at other on-site locations. Before disposing of excavated soil on site, this option would require pretreatment of soil

for PCBs and lead to meet state and federal LDRs. Ex situ pretreatment technologies are discussed in Section 3.2.4. On-site disposal is considered implementable and is retained for further consideration.

3.2.2.3 Off-Site Disposal

In this process, the excavated soil would be transported to a permitted off-site facility for disposal. Off-site disposal facilities include Class I, II, III, and recycling facilities. If the soil contains levels of contaminants exceeding their corresponding LDR, pretreatment of the contaminated media through ex situ technologies (Section 3.2.4) is required prior to disposal. Additionally, transportation to an off-site facility introduces a potential risk to the community via accidental releases.

Class I Facility

Class I treatment and disposal facilities often are capable of treating a variety of hazardous wastes, and therefore, may accept both nonhazardous and hazardous waste, as defined by 40 CFR 268 and Title 26, Div. 22 CCR 66268, for disposal. Based on discussions with various Class I facility personnel, a solidification or stabilization process is used to pretreat soils containing lead if the leachable lead concentration exceeds the LDR. Furthermore, facility representatives stated that, based on the analytical results from site investigations at Site 15, pretreatment processes will also immobilize the high PCBs in soil. The effectiveness of immobilization in meeting the treatment standards is subject to treatability study evaluation prior to acceptance. This option is retained for further evaluation.

Class II and III Facilities

Class II and III disposal facilities provide limited or no waste treatment services. Class II facilities may accept treated hazardous waste for disposal. However, Class II disposal facilities are limited in number, and discussions with facility personnel indicated that treated hazardous wastes are accepted only on a case-by-case basis. Class III disposal facilities accept soil waste that is considered nonhazardous, and generally do not accept treated hazardous waste for disposal. Therefore, Class II and III facility disposal options appear not feasible and are eliminated from further consideration.

Recycling Facility

Recycling facilities treat soils to generate a nonhazardous product that can be used as a road mix or ground cover for landfill sites. Recycling facilities generally accept nonhazardous wastes and may accept hazardous wastes. However, these soils will not be accepted for recycling based on discussions with recycling facility personnel regarding the elevated PCBs and lead concentration ranges detected in Site 15 soils. Therefore, this option is eliminated from further analysis in this EE/CA.

3.2.3 In Situ Treatment Actions

In situ treatment technologies include a variety of biological, chemical, and electrical processes. All of the in situ treatment options listed on Table 3-1 are eliminated from further consideration. As discussed in detail below, these treatment technologies were eliminated primarily because they are not effective for PCBs or lead or cannot be used in shallow soils.

3.2.3.1 Biological Treatment

In situ aerobic and anaerobic biological treatment technologies can be used to degrade PCBs in soil. However, biological treatment of PCBs is a slow process. In general, highly chlorinated PCBs (such as Aroclor-1260) are more resistant to biological degradation than less-chlorinated PCBs (for example, Aroclor-1242) (McCoy and Associates, Inc. 1992). The extent of degradation is highly dependent on numerous factors such as degree of chlorination, moisture content, pH, temperature, oxygen, and nutrient concentrations. Degradation of PCBs by aerobic bacteria has been observed in laboratory experiments; however, this process has not been fully demonstrated in the field.

Degradation of PCBs through anaerobic processes is potentially feasible; however, maintaining anaerobic conditions would be difficult in shallow vadose zone soil (that is, less than 2 feet bgs) at Site 15. In addition, to ascertain the effectiveness of biological treatment processes in treating the contaminated soil, extensive site characterization and treatability studies would have to be conducted. This remedial technology is not effective for treating heavy metals. Elevated levels of metals (for example, lead) present in soil are also likely to be toxic to the microbes. Therefore, in situ biological treatment is removed from further consideration.

3.2.3.2 Chemical Treatment

An in situ chemical treatment process has been identified as potentially applicable for PCBs and lead in soils; this process is solidification or stabilization. The terms solidification and stabilization are sometimes used interchangeably; however, subtle differences should be recognized. Solidification implies hardening or encapsulation to prevent leaching, whereas stabilization implies a chemical reaction or bonding to prevent leaching. Attempts to solidify or stabilize PCB-containing wastes to render them immobile have had mixed results, but this treatment technology is proven to immobilize heavy metals (for example, lead). Treatability studies are required to ascertain if wastes are compatible with this process and to establish treatment conditions for site soil. Solidification and stabilization processes may result in a significant increase in the volume of immobilized waste. In addition, in situ environmental conditions may affect ability to maintain immobilization of contaminants. This treatment process could limit future use of the site, which may be a concern as NAS Alameda is scheduled for closure. In situ solidification or stabilization is eliminated from further consideration because this treatment process has not been demonstrated for PCBs and is not technically feasible or cost-effective for shallow soils, according to treatment vendors.

3.2.3.3 Thermal Treatment

In situ thermal treatment processes include vitrification, which involves the use of high power electrical current (approximately 4 megawatts) transmitted into the soil by large electrodes that transform the treated material into a pyrolyzed mass. Organic contaminants (for example, PCBs) are destroyed or volatilized, and inorganic contaminants (for example, lead) are bound up in the glass-like mass that is created. Organic and inorganic off-gases must be controlled and treated. The high voltage used in the in situ vitrification process, as well as control of the offgases, present potential health and safety risks. The efficiency of in situ vitrification requires homogeneity of the target media. As with solidification or stabilization processes, vitrification could limit future use of the site. In situ vitrification is also a relatively complex, high-energy technology requiring a high degree of skill and training. Overall costs of this treatment technology are prohibitively high (higher than biological and solidification or stabilization processes) and regulatory and community acceptance are expected to be difficult to obtain. Therefore, in situ vitrification is not considered further in the EE/CA.

3.2.4 Ex Situ Treatment Actions

Ex situ treatment actions for treating excavated soil include technologies that specifically act to reduce the toxicity and volume of the chemicals of concern by physical, biological, chemical, or thermal processes. These treatment technologies can be implemented both on and off site.

3.2.4.1 Physical Treatment

Physical treatment technologies involve physically separating chemicals of concern from soil. Ex situ physical treatment processes considered for soils at Site 15 at NAS Alameda include soil washing.

The soil washing process separates contaminants sorbed onto soil particles from soil in an aqueous-based system. The wash water may be augmented with a basic leaching agent, surfactant, pH adjustment, or chelating agent to help remove organics or heavy metals. Soil washing is effective for removal of metals (for example, lead); however, this technology is less effective for PCBs. Fine soil particles, such as silts and clays, are difficult to remove from the washing liquid. However, soil washing is easy to implement and is retained for further evaluation.

3.2.4.2 Biological Treatment

Bioremediation processes potentially applicable for treating excavated soils include controlled solid-phase biological treatment and white-rot fungus. Controlled solid phase processes include prepared treatment beds, biotreatment cells, soil piles, and composting. Moisture, heat, nutrients, oxygen, and pH can be controlled to enhance biodegradation. In general, highly chlorinated PCBs (for example, Aroclor-1260) are more resistant to biological degradation than less chlorinated PCBs. Treatability testing is needed to evaluate biodegradability of contaminants and appropriate oxygen and nutrient loading rates. Inorganics (for example, lead) are not effectively remediated through biological processes, and elevated concentrations of heavy metals may be toxic to the microbes. Because biological degradation of PCBs has not been demonstrated in field studies and is not effective for treating lead, controlled solid-phase biological treatment processes are eliminated from further consideration.

Laboratory studies indicate that PCBs can be dechlorinated through the use of white rot fungus. White rot fungus is cultivated in a reactor, then forced into a secondary metabolic state by altering the reactor conditions. In this state, the fungus excretes enzymes capable of degrading organic compounds through catalytic oxidation reactions. Although white rot fungus has been successfully demonstrated to dechlorinate Aroclor-1242, -1254, and -1260 in laboratories, this treatment technology is not considered by EPA to be a demonstrated technology for pilot-scale use. In addition, white rot fungus is not effective in treating heavy metals such as lead. Therefore, white rot fungus is eliminated from further consideration in the EE/CA.

3.2.4.3 Chemical Treatment

Chemical treatment technologies considered for soils at Site 15 at NAS Alameda include solidification or stabilization, acid washing, solvent extraction, chemical dechlorination, and ultrasonic detoxification.

Solidification or stabilization processes are commonly used and best suited for immobilizing inorganics (for example, lead). The technology has varied effectiveness in immobilizing organic contaminants such as PCBs. Ex situ solidification or stabilization is relatively simple, uses readily available equipment, and has high throughput rates compared to other technologies. Treatability studies are required to finalize the treatment parameters. This treatment process is known to result in significant increases in volume of the immobilized end-product. This treatment technology is considered feasible and is retained for further consideration in the EE/CA.

Acid washing (also known as soil leaching) is a remedial action that addresses the limitations of metals removal by soil washing and enables remediation of metals to lower cleanup levels. Acid washing uses chemical processes to remove metals bound to sands, fine silts, and clays. A proprietary acid solution is used to dissolve crystalline metal oxides and chemically bound metals from the soil matrix into the soluble phase. The metals are then precipitated out of the acid wash for recovery, and the leaching solution is recycled through the process. Although acid washing does not effectively treat organics (such as PCBs), this process is effective for remediating metals (such as lead) contamination in soils and is retained for further evaluation.

Solvent extraction separates organic contaminants from solids and concentrates them in the solvent. This process minimizes the volume of waste that requires disposal. Solvent extraction has been proven to reduce PCB levels in soils to 1.0 mg/kg or less and can extract organically bound metals. Solvents used in this treatment process are generally volatile and will degrade readily; therefore, traces of solvent are not likely to remain after the distillation step. This process option is feasible and, therefore, is retained for detailed evaluation in this EE/CA.

Chemical dechlorination processes destroy PCBs by removing the chlorine atoms from the PCB molecule. This alters the chemical structure of the PCB molecule, reducing its toxicity. Dechlorination processes include using alkaline polyethylene glycolate (APEG) reagents (for example, potassium polyethylene glycolate [KPEG] and potassium glycol methyl etherate [KGME]), high-energy radiation (radiolytic dechlorination), metal-hydroxide-saturated solvents combined with photocatalytic effects (photochemical dechlorination), and hydrogen replacement in the presence of a catalyst (catalytic hydrodechlorination). All of these processes were developed for treatment of PCBs and are not effective for treatment of heavy metals. In addition, most of these treatment processes are still in the research stage and are considered emerging technologies. Only the APEG dechlorination process has been successfully field tested in treating PCBs. Capital and operations and maintenance (O&M) costs are generally high for these processes, including treatment and disposal of process water. Therefore, chemical dechlorination processes are eliminated from further consideration.

An innovative technology that uses high-frequency sound to destroy PCBs has been developed. The technology, called ultrasonic detoxification, removes halogens from organic compounds and renders them less hazardous or nonhazardous. The process involves mixing solid waste with a caustic solution and irradiating the mixture with ultrasonic energy. Specific feed size and material handling requirements can affect applicability or cost. Like chemical dechlorination processes, ultrasonic detoxification does not effectively treat heavy metals and is not yet considered a demonstrated technology. Therefore, the process is eliminated from further consideration.

3.2.4.4 Thermal Treatment

Three types of thermal treatment have been identified: incineration, thermal desorption, and the pyroplasmic™ process. Incineration uses high temperatures to volatilize and combust (in the presence

of oxygen) organic constituents in hazardous waste. Four common designs are rotary kiln, liquid injection, fluidized bed, and infrared incinerators. All four incinerator types have been used successfully to destroy PCBs to meet the 99.9999 percent requirement for PCBs and dioxins. Volatile metals, such as lead, may exit the stack or be concentrated in the bottom ash. Air emissions treatment and ash disposal costs are relatively high. Emissions of lead is regulated under the Boiler and Industrial Furnace (BIF) Regulations (Appendix VIII of 40 CFR 261). There are usually specific feed size and material handling requirements that can affect applicability or cost. Although capital and O&M expenditures associated with incinerators are relatively high, this treatment process reduces toxicity and volume of hazardous waste. Therefore, incineration is retained for further consideration.

Thermal desorption is an ex situ means to physically separate volatile and some semivolatile contaminants from soil. Contaminated waste is heated between 200°F to 1,000°F, driving off water and volatile contaminants. Thermal desorption has been proven effective in removing organic compounds, but is not designed to destroy them. Chemical contaminants for which bench-scale through full-scale treatment data exist include primary VOCs, SVOCs, and PCBs. Site-specific treatability studies may be necessary to document the applicability and performance of a thermal desorption system. It has been demonstrated that PCBs can be removed using low temperature thermal desorption (between 200°F to 600°F) systems. Thermal desorption is generally not effective in separating inorganics and metals from the contaminated media. The process also generates some residual streams (for example, condensed contaminants and water, fugitive dust, offgas) that must be treated and disposed of. Wastes with a high moisture content, indicative of Site 15 vadose zone soil, can result in low contaminant volatilization and increased treatment costs. Thermal desorption is eliminated from further consideration because it is not effective for treating lead, and site-soil properties are not conducive to treatment by this process.

Westinghouse Plasma Systems has developed a plasma arc torch that operates at extremely high temperatures and can decompose PCBs to form hydrogen, carbon monoxide, carbon, and hydrogen chloride. This treatment process, called pyroplasmic™ treatment, has been developed and used only to treat liquids contaminated with PCBs, and has not been proven to be effective for PCBs in soil. Therefore, pyroplasmic™ treatment process is eliminated from further consideration in the EE/CA.

4.0 DEVELOPMENT AND EVALUATION OF REMOVAL ACTION ALTERNATIVES

This section describes the removal action alternatives developed from the technologies and process options retained in Section 3.0. These removal action alternatives are assembled to meet the removal action objectives established for Site 15, and will be further evaluated to provide the basis for selecting preferred remedial alternatives.

4.1 DEVELOPMENT OF REMOVAL ACTION ALTERNATIVES

The following demonstrated and potentially applicable technologies or process options for remediation of soils at Site 15 have been retained after screening of general response actions and technologies:

- No Action
- Removal and Disposal Actions
 - Excavation
 - On-Site Disposal
 - Class I Facility Disposal
- Ex Situ Treatment Actions
 - Soil Washing
 - Acid Washing
 - Solvent Extraction
 - Solidification or Stabilization
 - Incineration

Since these technologies or process options do not individually satisfy the removal action objectives, they must be assembled into remedial alternatives. Certain technologies may necessarily be associated with other technologies. For example, depending on the concentration of constituents in the excavated soils and the applicability of LDRs, excavated soils may require treatment before disposal. The following specific removal action alternatives have been assembled for remediating soils at Site 15 at NAS Alameda based on the results of the technologies screening:

Alternative 1 - No Action

Alternative 2 - Excavation, On-Site Soil Washing, and On-Site Disposal

Alternative 3 - Excavation, On-Site Solidification or Stabilization, and On-Site Disposal

Alternative 4 - Excavation, On-Site Solvent Extraction and Stabilization or On-Site Solvent Extraction and Acid Washing, and On-Site Disposal

Alternative 5 - Excavation and Off-Site Incineration

Alternative 6 - Excavation and Class I Disposal With or Without Pretreatment

Alternative 1: No Action

Alternative 1 includes periodic inspection and monitoring of groundwater as it may be affected by existing vadose-zone soil contamination.

Alternative 2: Excavation, On-Site Soil Washing, and On-Site Disposal

Alternative 2 includes removing soil containing PCBs exceeding 1.0 mg/kg and total lead concentrations exceeding 130 mg/kg; separating PCBs and lead from soil in an aqueous-based system; and disposing of treated soil on site by backfilling into the excavation area (highly contaminated rinse water and residual soils would be treated and disposed of at an off-site incineration facility).

Alternative 3: Excavation, On-Site Solidification or Stabilization, and On-Site Disposal

Alternative 3 includes removing soil containing PCB concentrations exceeding 1.0 mg/kg and total lead concentrations exceeding 130 mg/kg; immobilizing leachable lead concentrations and PCBs in soil through on-site solidification or stabilization treatment; and disposing of treated soil on site by backfilling into the excavation (excess treated soil would be disposed of at an off-site Class I facility).

Alternative 4: Excavation, On-Site Solvent Extraction and Stabilization or On-Site Solvent Extraction and Acid Washing, and On-Site Disposal

Alternative 4 includes removing soil containing PCB concentrations exceeding 1.0 mg/kg and total lead concentrations exceeding 130 mg/kg; separating PCBs from soil through on-site solvent extraction and, if necessary, immobilizing leachable lead concentrations through on-site stabilization or removing leachable lead through on-site acid washing; and disposing of treated soil on site by backfilling into the excavation area (concentrated solvent residual would be disposed of at an off-site incineration facility).

Alternative 5: Excavation and Off-Site Incineration

Alternative 5 includes removing soil containing PCB concentrations exceeding 1.0 mg/kg and total lead concentrations exceeding 130 mg/kg; and volatilizing and combusting soil to destroy PCBs and remove lead by off-site incineration (concentrated ash would be treated and disposed of at an off-site Class I facility).

Alternative 6: Excavation and Class I Disposal With or Without Pretreatment

Alternative 6 includes removing soil containing PCB concentrations exceeding 1.0 mg/kg and total lead concentrations exceeding 130 mg/kg; and disposing of the excavated soil at a Class I facility, with or without treatment for lead and PCBs in soil through off-site solidification and stabilization.

These six alternatives are evaluated in detail in terms of effectiveness, implementability, and cost in the following section.

4.2 EVALUATION OF REMOVAL ACTION ALTERNATIVES

A detailed evaluation includes a definition of each alternative with respect to the area of affected soil, the technologies used, any associated performance requirements, and the assumptions used in establishing costs for each alternative. A comparative analysis among the alternatives is presented in Section 4.3.

4.2.1 Evaluation Criteria

The identified removal action alternatives are evaluated based on three criteria: (1) effectiveness; (2) implementability; and (3) estimated costs including capital and O&M costs, as described below.

4.2.1.1 Effectiveness

The effectiveness of an alternative refers to its ability to meet the cleanup objectives within the scope of the removal action. In particular, these objectives should address: (1) overall protection of public health, community, and the environment; (2) ability to achieve the target cleanup levels; reduction of toxicity, mobility, or volume through treatment; and long-term effectiveness and permanence; and (3) preference of treatment over land disposal alternatives where practicable treatment technologies are available.

4.2.1.2 Implementability

The implementability criterion encompasses the technical and administrative feasibility of implementing an alternative and the availability of various services and materials required. Technical feasibility is used to eliminate those alternatives that are clearly impractical at a site. Administrative feasibility evaluates those activities needed to coordinate with other offices and agencies (for example, permits and waivers). The EE/CA must determine if off-site treatment, storage, and disposal capacity, equipment, personnel, services and materials, and other resources necessary to implement an alternative will be available as needed to maintain the removal action schedule. In addition, regulatory agency and community acceptance should be considered when recommending the preferred remedial alternative.

4.2.1.3 Cost

Each removal action alternative is evaluated to determine its projected costs. The evaluation compares each alternative's capital and O&M costs. However, because each removal action alternative can be implemented in a relatively short period of time, any associated O&M costs are included in the capital cost. These costs are prepared using many sources and include vendor

estimates, disposal facility fees, and estimates for similar projects. This accuracy has been defined to fall within the range of +50 percent to -30 percent of the estimated total cost (USEPA 1987). Table 4-1 summarizes the estimated capital cost for each alternative.

4.2.2 Analysis of Removal Action Alternatives

The analysis of each removal action alternative is organized in the following manner. First, a detailed description of the alternative is presented, including any necessary assumptions regarding its conceptual design and operational parameters. Subsequently, each alternative is evaluated based on its relative effectiveness, implementability, and estimated cost.

4.2.2.1 Alternative 1: No Action

Description

This removal action alternative is retained for analysis to provide a basis for comparison with other alternatives. For this alternative, no remedial activities for soil would be implemented at Site 15 at NAS Alameda. The no-action alternative would include monitoring of on-site and nearby downgradient wells. However, because monitoring will be carried out as part of the current ongoing NAS Alameda RI/FS, the estimated cost for monitoring is not included in this alternative.

Effectiveness

Removal action objectives would not be achieved through naturally occurring processes, such as biodegradation. Natural degradation of PCBs through biological processes is unlikely because this process is dependent on numerous factors (for example, oxygen, temperature, pH, and nutrients) and because degradation of highly chlorinated compounds, such as PCBs, is difficult and would require a long period of time. Biodegradation does not effectively treat for lead, which may be toxic to microbes. Under the no-action scenario, the contaminants could remain on site until a final risk assessment decision is made in the ROD. PCBs may migrate and lead may leach from soil into groundwater due to the lack of containment of chemicals in the vadose-zone soil. But in general, no reduction of toxicity, mobility, or volume of PCBs and lead at this site would be achieved. The no-

TABLE 4-1
CAPITAL COST ESTIMATE SUMMARY
SITE 15 FORMER TRANSFORMER STORAGE AREA
NAS ALAMEDA

Alternative No.	Alternative Description	Estimated Capital Cost ^a
1	No Action	\$0
2	Excavation On-Site Soil Washing On-Site Disposal	\$2,400,000
3	Excavation On-Site Solidification or Stabilization On-Site Disposal	\$1,500,000
4A	Excavation On-Site Solvent Extraction and Stabilization On-Site Disposal	\$2,500,000
4B	Excavation On-Site Solvent Extraction and Acid Washing On-Site Disposal	\$3,300,000
5	Excavation Off-Site Incineration	\$11,000,000
6A	Excavation Class I Disposal with Pretreatment	\$2,200,000
6B	Excavation Class I Disposal without Pretreatment	\$1,400,000

Notes:

^a Estimated capital costs rounded to two significant figures. Operations and maintenance (O&M) costs are included in the estimated capital cost because each remedial alternative is assumed to be implemented within one year.

Groundwater monitoring costs of wells located at Site 15 are part of the ongoing NAS Alameda RI/FS and are not included in any of these alternatives.

See Appendix B for detailed costs.

action alternative would not be effective in reducing risk to public health and the environment in the short term. This alternative would not offer long-term effectiveness and permanence.

Implementability

The no-action alternative is easily implementable.

Cost

There are no capital or O&M costs associated with the no-action alternative. Groundwater quality would be monitored on a routine basis to ensure the long-term effectiveness of the no-action alternative. As discussed earlier, these costs are assumed to be included in the ongoing NAS Alameda RI/FS.

4.2.2.2 Alternative 2: Excavation, On-Site Soil Washing, and On-Site Disposal

Description

This alternative consists of soil excavation, as shown on Figure 2-4, and on-site treatment of soil by soil washing to remove PCBs and lead from soil. Treated soils would be sampled and analyzed to confirm that federal and state LDRs are met prior to disposal on site by backfilling the excavated area. Excavation, on-site treatment, and on-site disposal details are described below.

Excavation

For this site, excavation and hauling of soils would be achieved using conventional earthwork equipment such as a backhoe, bulldozers, and trucks. Few obstructions to excavation are likely during implementation of remedial activities at the Site 15 at NAS Alameda. Activities associated with soil excavation include the following:

- **Mobilization and Site Preparation.** Mobilization consists of all activities associated with mobilizing equipment to Site 15 and preparation of staging areas. Site preparation activities include demolishing Buildings 283 and 301, clearing vegetation,

decommissioning utilities, removing necessary portions of site fencing, destroying all monitoring wells located within the excavated area, setting up the on-site soil washing treatment system, and performing the preliminary earthwork necessary for excavation. Site preparation work also includes construction of a temporary chain-link fence, with gates, around the proposed excavation area to prevent unauthorized access to the work area.

- Sloping. Sloping or shoring are not required, as discussed in Section 3.2.2.1.
- Excavation. Excavation of contaminated soil is initiated using a backhoe or other earthwork equipment. Soil is removed from the excavation and temporarily stockpiled on visqueen at an adjacent area. The soil is subsequently transferred to and stockpiled at a designated area for on-site soil washing activities. Excavated concrete or asphalt pavement is stockpiled separately, sampled, analyzed, and disposed of at a concrete recycling or landfill facility.
- Sampling. Confirmation sampling includes screening level and final confirmation sampling. Screening level sampling will be conducted after the agreed-upon extent of excavation has been attained to assess if additional excavation is required. On completing the excavation, final confirmation sampling will be conducted for verification. The final confirmation samples will assess the residual PCB and lead concentrations in soil for RI/FS risk assessment purposes. It is assumed that screening level and final confirmation sampling includes collecting one sample per approximately 850 square feet of excavation.
- Backfill and Compaction. When the excavation is completed, the excavated area will be backfilled and compacted with the treated soil. All groundwater monitoring wells destroyed prior to excavation will be replaced. After the backfill and compaction and well installations are completed, the removal action for Site 15 will be complete.

On-Site Soil Washing

Soil washing separates the PCBs and lead from the soil, thus reducing the volume of contaminated soil. Contaminants sorbed onto soil particles are separated from soil in an aqueous-based system. The wash water may include a basic leaching agent, surfactant, pH adjustment, or chelating agent to help remove organics or heavy metals. The effectiveness of the treatment process requires verification by a treatability study conducted prior to field work to determine the reagent requirements. The objectives of the treatability study are to (1) evaluate the effectiveness of this treatment process in meeting the treatment goal; (2) evaluate basic leaching agents, surfactants, pH adjustment, or chelating agents; (3) evaluate the optimum concentration of agents used and washing time; and (4) estimate the final condition of treated soil and volume reduction. On-site locations will

be needed to stockpile and treat soil. Posttreatment of fine soil particles and wash water is assumed to be required.

On-Site Disposal

Disposal of soil on site consists of backfilling the treated soil into the excavation. Because soil washing generally results in a decrease in volume of treated soil, additional fill material would have to be procured for backfilling the excavation to grade. On-site disposal must be acceptable to regulatory agencies and the community, in addition to meeting state and federal LDRs. Disposal on site may require installing additional groundwater monitoring wells to monitor the potential leaching of the treated backfill. Regulatory agencies will not allow treated soil to be used as backfill unless it passes the California WET test as discussed in Section 2.5. Obtaining regulatory and community acceptance of on-site disposal of treated soil is generally good if treatment standards are met.

Effectiveness

By removing and treating Site 15 soil with high PCB and lead concentrations, the volume of contaminated soil is reduced. This process offers the potential for recovery of lead; however, separating PCBs from soil may be less effective. When contaminated fine-grained material has been separated, coarse-grained soil can usually be returned to the site thus eliminating the potential for any future releases to groundwater. However, the ability of soil washing to meet proposed cleanup levels and state and federal LDRs for backfilling is uncertain. In addition, PCBs and lead would be highly concentrated in the residual washing agent and fine-grained soil and may require extensive treatment, such as incineration. Short-term effectiveness is considered high because the excavation, treatment, and backfilling of the soil can be completed within a relatively short period of time. Potential adverse exposure to site workers and the public and potential environmental impacts during implementation is minimal. However, these risks and impacts can be mitigated with the use of appropriate health and safety controls (for example, PPE) and site controls (for example, dust suppression by wetting soil). Implementation of this alternative will provide a high degree of protection to both human health and the environment on a long-term basis. Because the toxicity of the treated soil is removed, the liability associated with disposal on site for Alternative 2 is minimal.

Implementability

Excavation of contaminated soil is implementable. In addition, site characteristics are generally favorable for excavation activities. Although Buildings 283 and 301 (old, metal structures) need to be demolished, three monitoring wells destroyed, and some concrete (the foundation of former Building 389) and asphalt pavement excavated, the majority of the site is bare ground with little or no vegetation. Mobilizing a soil washing system on site is implementable, but requires obtaining a regulatory temporary treatment unit (TTU) permit. Soil disposal on site is generally acceptable to the regulatory agencies and the community if treated to below state and federal LDRs. However, as discussed above, implementing Alternative 2 to meet cleanup requirements for PCBs may be difficult. Overall, this alternative is anticipated to be difficult to implement.

Cost

On-site soil washing processes are generally capital-cost intensive. Table 4-1 presents the estimated capital cost for implementing Alternative 2. The estimated capital cost includes treatment system O&M and is approximately \$2.4 million. Reinstallation of three groundwater monitoring wells is included in the estimated capital cost. However, costs for monitoring groundwater quality on a routine basis are assumed to be included in the ongoing NAS Alameda RI/FS. Details of the capital cost are included in Appendix B.

4.2.2.3 Alternative 3: Excavation, On-Site Solidification or Stabilization, and On-Site Disposal

Description

This alternative is the same as Alternative 2 except that removed soil is treated on site through solidification or stabilization treatment processes.

Excavation

Excavation activities for this alternative would be as described in Section 4.2.2.2.

On-Site Solidification or Stabilization

The purpose of solidification or stabilization is to immobilize the lead and PCBs in soil by mixing the soil with chemical agents. This process is a commonly used method for treating lead in soil.

However, the ability of solidification or stabilization to immobilize PCBs is uncertain. The effectiveness of soil treatment would require verification by a treatability study that should be performed before field work begins. The objectives of the treatability study are to evaluate (1) the effectiveness of this treatment process in meeting the treatment goal; (2) solidification or stabilization agents; (3) the optimum concentration of agents used and curing time; and (4) the final condition of treated soil and volume increase. On-site locations would be needed to stockpile and treat soil. No post-solidification or stabilization treatment of the soils is assumed to be required.

On-Site Disposal

On-site disposal would be as described in Section 4.2.2.2 except that solidification or stabilization of soil generally produces a resultant soil product of increased volume that may require disposing of off site in addition to backfilling the excavation area. It is assumed that all the excavated soil will require treatment by solidification or stabilization before disposal.

Effectiveness

The mobility of the contaminants in soil is reduced by removing and treating Site 15 soil containing PCBs above 1.0 mg/kg and lead above 130 mg/kg. Solidification or stabilization processes have demonstrated capability to reduce the mobility of contaminated waste by greater than 95 percent. However, backfilling the treated soil into the excavation reduces but does not eliminate the potential for any future releases to groundwater. Continued monitoring of leaching and conditions of the backfill is required. The short-term effectiveness is considered high because the excavation, treatment, and backfilling of the soil can be completed within a relatively short period of time. Potential adverse exposure to site workers and the public and potential environmental impacts during implementation is minimal. However, these risks and impacts can be mitigated with the use of appropriate health and safety controls (for example, PPE) and site controls (for example, dust suppression by wetting soil). But environmental conditions may affect the long-term immobilization of

contaminants. Implementation of this alternative may provide only a moderate degree of protection to both human health and the environment on a long-term basis. Therefore, the liability associated with disposal on site for Alternative 3 is moderate because of pending base closure and potential residential reuse.

Implementability

As discussed in Section 4.2.2.2, the excavation aspect of this alternative is implementable and site conditions are generally favorable. The solidification or stabilization process is a commonly applied technology and could be easily implemented on site. However, soil immobilization processes result in an end-product with increased volume that may require disposing of off site in addition to backfilling the excavation area. Some stabilization processes produce a concrete-like material that is difficult to backfill. On-site disposal may not be acceptable to the regulatory agencies or the community because this action is essentially a temporary solution with future land transfer problems. In addition, this process reduces only contaminant mobility and not toxicity. Depending upon the contaminants and the chemical reactions that occur in the solidification or stabilization process, the resultant immobilized mass may have to be handled as a hazardous waste. Therefore, on-site disposal of the treated soils may not be feasible. Overall, this alternative is anticipated to be difficult to implement.

Cost

Table 4-1 shows the estimated capital cost for implementing Alternative 3. The capital cost for Alternative 3 is approximately \$1.5 million. The estimated capital cost for implementing this alternative includes treatment system O&M and reinstallation of three groundwater monitoring wells. The costs for monitoring groundwater quality on a routine basis are assumed to be included in the ongoing RI/FS. Appendix B presents the detailed capital costs.

4.2.2.4 Alternative 4: Excavation, On-Site Solvent Extraction and Stabilization or On-Site Solvent Extraction and Acid Washing, and On-Site Disposal

Description

This alternative is the same as Alternative 2 except that removed soil would be treated on site through solvent extraction and stabilization or acid washing treatment processes.

Excavation

Excavation activities for this alternative would be as described in Section 4.2.2.2.

On-Site Solvent Extraction and Stabilization or On-Site Solvent Extraction and Acid Washing

This alternative combines two treatment processes: solvent extraction and stabilization or acid washing. PCBs are first removed from the soil through solvent extraction. During the drying-phase of the solvent extraction process, chemical agents can be mixed with the soil to immobilize the lead or acid washing can be performed to remove leachable lead concentrations from the soil when the solvent extraction process is complete. Residual solvents, acids, and untreated wastes would generally contain highly concentrated contaminants that require disposal at an off-site incineration facility. The combination of solvent extraction and stabilization treatment technologies is considered the most effective process for removing PCBs and treating lead according to several treatment vendors. This process combination has been demonstrated for treating soil with PCBs and metals (Weamer 1994). The combination of solvent extraction and acid washing is considered effective for treating PCBs and remediating metals to lower cleanup levels. However, the effectiveness of implementing this combination of technologies requires verification by treatability studies that should be conducted before field work begins. The objectives of the treatability studies are to (1) evaluate the effectiveness of these treatment processes in meeting the treatment goal; (2) evaluate solvents, acids, and stabilization agents; (3) evaluate the optimum concentration of solvents, acids, and agents used and curing time; and (4) estimate the final condition of treated soil. On-site locations are needed to stockpile and treat soil. No post solvent extraction and stabilization or acid washing treatment of the soils is assumed to be required.

On-Site Disposal

On-site disposal is described in Section 4.2.2.2, except that solvent extraction and acid washing will result in a reduced volume of treated soil while stabilization of soil would produce a final soil product of increased volume. It is assumed that all the excavated soil would require treatment for PCBs by solvent extraction and that approximately 50 percent of all the excavated soil would require treatment for lead (Figure 2-4) by stabilization or acid washing before disposal. The quantity of leachable lead-contaminated soil requiring remediation will be verified prior to or during the removal action using the WET.

Effectiveness

By removing and treating Site 15 soil containing PCBs above 1.0 mg/kg and lead above 130 mg/kg, the toxicity, volume, and mobility of the contaminants in soil are reduced. Solvent extraction has been proven to reduce PCB levels in soils to 1.0 mg/kg or less and may remove organic lead. Stabilization processes have demonstrated the capability to reduce the mobility of leachable metals, such as lead. Backfilling the treated soil into the excavation reduces but does not eliminate the potential for any future releases of lead to groundwater. Continued monitoring of lead leaching and conditions of the backfill is required. The short-term effectiveness is considered moderate because excavation, treatment, and backfilling of the soil can be completed within a relatively short period of time (approximately 6 to 8 months). Potential adverse exposure to site workers and the public and potential environmental impacts during implementation is minimal. However, these risks and impacts can be mitigated with the use of appropriate health and safety controls (for example, PPE) and site controls (for example, dust suppression by wetting soil). Implementation of this alternative provides an adequate degree of protection to both human health and the environment on a long-term basis. However, the liability associated with disposal on site for Alternative 3 is moderate because of pending base closure and potential residential reuse.

Acid washing of contaminated soil enables remediation of lead to lower cleanup levels and reduces the toxicity, volume, and mobility of lead in soil to meet state and federal LDRs. Because leachable lead concentrations are reduced below the STLC, backfilling the treated soil into the excavation eliminates the potential for any future releases of lead to groundwater. Continued monitoring for lead leaching

and conditions of the backfill would not be required. This alternative can be implemented within approximately 4 months and provides an adequate degree of protection to both human health and the environment on a long-term basis.

Implementability

As discussed in Section 4.2.2.2, the excavation aspect of this alternative is implementable and site conditions are generally favorable. Solvent extraction and stabilization or acid washing processes are commonly applied technologies and could be easily implemented on site. Site mobilization of two of the three treatment processes may require more operation area as opposed to one treatment system. On-site backfilling of soil treated by solvent extraction and stabilization is difficult and may create future land use problems because some stabilization processes result in an end product exhibiting concrete-like properties, whereas on-site disposal of soil treated by solvent extraction and acid washing is easily implementable. On-site disposal of treated soil is anticipated to be acceptable to the regulatory agencies or the community because this alternative reduces contaminant toxicity, volume, and mobility. In addition, no air emissions are produced using this treatment process. Overall, this alternative may be difficult to implement.

Cost

For costing purposes, two versions of Alternative 4 have been developed: (A) excavation, on-site solvent extraction and stabilization, and on-site disposal; and (B) excavation, on-site solvent extraction and acid washing, and on-site disposal. The estimated capital cost for implementing Alternative 4A is \$2.5 million and for Alternative 4B is \$3.3 million. Table 4-1 presents details of the associated costs. As discussed earlier, costs for reinstallation of three groundwater monitoring wells are included in the capital cost. Costs for monitoring groundwater quality on a routine basis are assumed to be included in the ongoing NAS Alameda RI/FS. Details of the capital cost are included in Appendix B.

4.2.2.5 Alternative 5: Excavation and Off-Site Incineration

Description

This alternative consists of soil excavation from Site 15 at NAS Alameda. Soils would then be transported and treated off site at an incineration facility.

Excavation

Excavation activities for this alternative are described in Section 4.2.2.2, except that soil will be removed from the excavation area, temporarily stockpiled, then transferred to an area designated for loading onto trucks for transport to an incineration facility. The excavation is backfilled with clean fill.

Off-Site Incineration

Incineration of soil uses high temperatures to destroy PCBs and to reduce the toxicity and volume of contaminated waste. Incineration of PCB wastes is a commonly accepted treatment technology. Volatile metals, such as lead, leave the combustion unit with the flue gases or remain in bottom ash. Off gases and resultant ashes require treatment before discharging to the atmosphere or landfilling. The potential risks for using an off-site incinerator involve transporting the hazardous material through the community. The closest off-site incineration facility is located in Utah. On-site locations are required for temporary stockpiling of soil before transporting to the incineration facility. It is assumed that all the excavated soil will require treatment by incineration and all ash by-products will require treatment for lead and disposal at a Class I facility.

Effectiveness

By removing and treating Site 15 soil containing PCBs above 1.0 mg/kg and lead above 130 mg/kg, the toxicity and volume of hazardous waste are mitigated. In addition, because excavated soil is replaced with clean material, the potential for any future releases to groundwater is effectively eliminated. The short-term effectiveness of implementing Alternative 5 is considered high, because

the excavation and treatment of the soil can be completed within a relatively short period of time. Implementation of this alternative will also permanently reduce the long-term risk to human health and the environment, with the exception of landfilling of the ash.

Implementability

Excavation activities for this alternative are implementable, as discussed in Section 4.2.2.2. Transportation of contaminated soil between the site and the incineration facility requires complying with state and federal department of transportation regulations. Incineration is one of the most mature remediation technologies and has been selected or used as the remedial action at more than 150 Superfund sites. However, incineration of Site 15 soil is subject to a series of technology-specific regulations that may include the following federal statutes and requirements: Clean Air Act (CAA) (for air emissions), TSCA (for PCB treatment and disposal), RCRA (for hazardous waste generation, treatment, storage, and disposal), National Pollutant Discharge Elimination System (NPDES) (for discharge to surface waters), Noise Control Act (NCA) (for noise), and RCRA (for air emissions). In general, this alternative is easy to implement.

Cost

Implementing Alternative 5 requires no capital and O&M expenditures. However, treatment and disposal costs for use of an off-site incineration facility are prohibitively high in general. The estimated cost for implementing Alternative 5 is \$11 million as presented on Table 4-1. On-site groundwater monitoring costs are considered to be included in the ongoing NAS Alameda RI/FS. Details of the costs for this alternative are included in Appendix B.

4.2.2.6 Alternative 6: Excavation and Class I Disposal With or Without Pretreatment

Description

This alternative is the same as Alternative 5 except that removed soils will be transported to and disposed of at an off-site Class I facility with or without pretreatment.

Excavation

Excavation activities for this alternative are described in Section 4.2.2.2, except that soil is removed from the excavation area, temporarily stockpiled, then transferred to an area designated for loading onto trucks for transport to a Class I disposal facility. The excavation is backfilled with clean fill.

Class I Disposal

All excavated soil is assumed to be transported and disposed of off site at a permitted Class I treatment and disposal facility. Some pretreatment of the contaminated soils may be required to meet state and federal LDRs depending on contaminant concentrations. Disposal of soil is subjected to LDRs if it contains lead at concentrations exceeding the TCLP of 5.0 mg/L. According to a Class I facility representative, soil containing PCBs would most likely be disposed of in a TSCA-permitted landfill. Transportation to the off-site facility introduces a potential risk to the community via accidental release. On-site locations would be required for temporary stockpiling of soil before transporting to the Class I facility. It is assumed that all the excavated soil would be disposed of at the Class I facility with or without pretreatment by the Class I facility.

Effectiveness

By moving soil with elevated PCB and lead concentrations from the site to a facility that will physically contain it, the mobility of the contaminants is reduced. The Class I treatment and disposal facility would ensure that stringent LDRs are met with or without waste pretreatment, thus attaining long-term effectiveness or permanence. However, the Navy could ultimately be liable in future litigation. In addition, by backfilling the excavation with clean material, the potential for future releases to groundwater at Site 15 would be permanently eliminated. This alternative would achieve the removal action objectives for Site 15 over a short period of time and would be effective over the short term; however, the Navy would increase its liability by disposing its waste in a landfill. In addition, federal guidance states that off-site transport and disposal of hazardous substances or contaminated material is the least preferred remedial action alternative where practicable treatment technologies exist.

Implementability

The excavation activities for this alternative are implementable, as discussed in Section 4.2.2.2. The Class I landfill requires development of a waste profile for incoming waste streams. Based on the results of the profile and LDRs, pretreatment for particular compounds may or may not be required prior to disposal. Class I facility personnel indicated that, based on the available Site 15 analytical data, soil would be accepted for disposal with pretreatment for elevated concentrations of lead only. Facility personnel indicated that the pretreatment process for lead would also effectively treat PCBs. It is assumed that on completion of the pretreatment process for lead, no further post-treatment is required for land disposal. Liability risks associated with soil disposal at a Class I facility are potentially high. Disposal of soil at a Class I facility is easy to implement.

Cost

Implementing this alternative requires no capital investment and, once disposal is completed, no O&M costs. For costing purposes, two versions of Alternative 6 have been developed: (A) excavation and Class I disposal with pretreatment, and (B) excavation and Class I disposal without pretreatment. Details of the associated costs are provided on Table 4-1. The estimated cost for Alternative 6A (soil excavation and Class I disposal with pretreatment) and Alternative 6B (soil excavation and Class I disposal without pretreatment) are \$2.2 million and \$1.4 million, respectively. Costs for groundwater monitoring at Site 15 are considered to be included in the ongoing NAS Alameda RI/FS. Appendix B includes the detail cost summaries for these alternatives.

Table 4-1 shows the present worth cost for Alternative 6A (\$2.2 million) and Alternative 6B (\$1.4 million). These costs would all be incurred in the first year.

4.3 COMPARATIVE ANALYSIS OF REMOVAL ACTION ALTERNATIVES

This section presents a comparative analysis of the six alternatives retained for detailed evaluation. The objective of the comparative analysis is to assess the relative performance of each alternative with respect to the evaluation criteria (Section 4.2.1). To facilitate this analysis, Table 4-2 has been

**REMEDIAL ALTERNATIVES COMPARISON SUMMARY
SITE 15 FORMER TRANSFORMER STORAGE AREA
NAS ALAMEDA**

Remedial Alternative	Effectiveness	Implementability	Estimated Total Capital Cost
<u>Alternative 1</u> No Action	Inadequate protection to human health and the environment. Removal action objectives are not attained with this alternative. Contaminants will remain on site. Natural biodegradation processes results in little or no remediation over a long period of time.	Alternative is technically but not administratively implementable (that is, public and regulatory agency acceptance may be difficult). Does not remove liability associated with land reuse.	\$0
<u>Alternative 2</u> Excavation, On-Site Soil Washing, and On-Site Disposal	Provides moderate protection to human health and the environment. Removal action objectives are not likely to be achieved with this alternative. Soil washing may not be effective for removing PCBs. Treated soil that is backfilled may affect the groundwater over a long period of time.	Alternative may be relatively difficult to implement. On-site soil washing would require permitting. Effectiveness of treatment requires verification by treatability study. By-products may require treatment or disposal. Regulatory and community acceptance of on-site disposal difficult.	\$2.4 million
<u>Alternative 3</u> Excavation, On-Site Solidification or Stabilization, and On-Site Disposal	Provides moderate protection to human health and the environment. Removal action objectives are not likely to be achieved with this alternative. Immobilization of PCBs not proven. Treated soil that is backfilled on site may affect groundwater over a long period of time.	Alternative may be relatively difficult to implement. On-site immobilization would require permitting. Effectiveness of treatment requires verification by treatability study. Regulatory and community acceptance of on-site disposal difficult.	\$1.5 million
<u>Alternative 4</u> Excavation, On-Site Solvent Extraction and Stabilization or Acid Washing, and On-Site Disposal	Provides adequate protection to human health and the environment. Removal action objectives are likely to be achieved with this alternative. PCBs removed from soil and lead immobilized or removed. Therefore, treated soil disposed on site should not affect the groundwater over a long period of time.	Alternative may be relatively difficult to implement. On-site solvent extraction and stabilization or acid washing would require permitting. A treatability study would be required to assess effectiveness. By-products may require treatment or disposal. Regulatory and community acceptance of on-site disposal of stabilized soil may be difficult; however, backfilling of acid-washed soil should be implementable.	\$2.5 million (with stabilization) \$3.3 million (with acid washing)
<u>Alternative 5</u> Excavation and Off-Site Incineration	Provides adequate protection to human health and the environment. Removal action objectives are achieved with this alternative. Because soils would be permanently removed from the site, this alternative is highly effective in eliminating impacts to groundwater.	Alternative is implementable.	\$11 million
<u>Alternative 6</u> Excavation and Class I Disposal with or without pretreatment	Provides adequate protection to human health and the environment. Removal action objectives are achieved with this alternative. Because soils would be permanently removed from the site, this alternative is highly effective in eliminating impacts to groundwater. Off-site disposal is least preferred remedial alternative.	Alternative is implementable. Facility treatability study required to determine if pretreatment is necessary. Class I disposal facility likely to accept and dispose of waste with or without pretreatment in accordance with federal and state land LDRs.	\$2.2 million (with treatment) \$1.4 million (without treatment)

developed to summarize the relative merits of each alternative with respect to effectiveness, implementability, and cost. Details of the comparative analysis of alternatives are discussed below.

Six removal action alternatives (1, 2, 3, 4, 5, and 6) were assembled for detailed analysis. As shown on Table 4-2, Alternatives 4, 5, and 6 are similar in terms of the level of protection to human health and the environment. Alternative 1 does not provide adequate short-term or long-term effectiveness or permanence at Site 15 because contaminants are not removed. Therefore, Alternative 1 is eliminated. Alternatives 2 and 3 are eliminated because their effectiveness in treating PCBs or lead is not proven and does not provide adequate long-term effectiveness or permanence at the site. Achieving long-term effectiveness or permanence is of great importance in reducing potential future liability risks to the Navy, particularly in lieu of the pending base closure and potential reuse issues.

Alternatives 4, 5, and 6 are effective and satisfy the identified removal action objectives for Site 15. Although Alternative 5 effectively reduces contaminant toxicity and volume through incineration, the cost for implementing this alternative is prohibitively high, as much as five times the cost of the other two remedial alternatives. Therefore, Alternative 5 is eliminated.

The two remaining alternatives are Alternatives 4 and 6. Alternative 4 has been proven to effectively treat PCBs and lead in soil, although a treatability study would be required to determine the optimal solvents, acids, reagents, and system operation parameters. This alternative would require an estimated 30 days for system mobilization and demobilization, and 60 to 90 days for soil treatment. Regulatory permits must be obtained for operating an on-site treatment system. Implementing Alternative 4A, through treatment by solvent extraction and stabilization may produce a concrete-like end-product with stabilized lead that would be difficult to dispose of on site and that could create future land use problems; whereas by implementing Alternative 4B, excavated soil could be remediated through solvent extraction and acid washing processes to meet PCB and lead cleanup levels and could be easily backfilled on-site. Therefore, Alternative 4A is eliminated because on-site disposal of stabilized lead does not provide adequate long-term protection for either human health or the environment. Alternative 6 is potentially less expensive to implement and would require a shorter period of time to complete than Alternative 4B. However, the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) states that the transport and disposal of hazardous substances or contaminated materials off site without treatment should be the least favored

alternative remedial action. Therefore, Alternative 6 is eliminated because treatment approaches are preferred over land disposal approaches.

Alternative 4B is the preferred alternative for remediation of soil at Site 15 based on the evaluation. Alternative 4B (soil excavation, on-site treatment using solvent extraction and acid washing, and disposal on site), is the most implementable alternative for treatment and disposal of Site 15 soil with elevated PCB and lead concentrations. This alternative mitigates the risk to human health and the environment and reduces the potential impacts of soil contaminants on the groundwater by treating soil to meet proposed cleanup levels (less than 1.0 mg/kg for PCBs and less than 130 mg/kg for lead) and state and federal LDRs. Therefore, implementing Alternative 4B meets the removal action objectives identified in this EE/CA.

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APPENDIX A

DATA VALIDATION REPORT AND LABORATORY RESULTS

DATA VALIDATION REPORT

Site Name/CTO No.: NAS Alameda, CTO 258

Laboratory: ETC/Mid-Pacific

QA Reviewer: Beth Kelly, PRC Environmental Management, Inc.

PRC Batch/SDG No.: TC103 & U1040

PRC Sample No(s): S10, S12, S13, S16, S17, S19, S21, S22, S23, S24, S25, S26, S27, S28, S29, S31, S34, S35, S37, S39, S40, S41, S42

Matrix: 23 Soil samples

QA Level: Full Validation on samples S10, S19, S23, S25, S28, S29, S41 for metals, S21, S24 for pesticides, S17, S29 for semivolatiles
Cursory validation performed on all samples.

QC Criteria Reviewed: Data Validation Requirements, Section 2.0

Report Date: 2/9/94

1.0 INTRODUCTION

Data were validated according to EPA documents, "National Functional Guidelines for Organic Data Review" (December 1990) and "Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses" (July 1988), and the precision and accuracy goals included in the Naval Air Station, Alameda Remedial Investigation/Feasibility Study Work Plan Addendum (PRC, 1993). Section 2.0 of this data validation report lists the criteria reviewed based on EPA documents. Section 3.0 is the glossary of qualifiers used in validating the data, and Section 4.0 provides an assessment of data by methodology.

Table 1 identifies the PRC sample numbers (corresponding to the designated laboratory identification number on Table 1 of the work plan for Site 15), collection dates, analyses performed, and quality control samples associated with this sample delivery group. The results of all these analyses are discussed in Section 4.0, Data Assessment. Following the narrative are the qualified laboratory sample results (report forms) and the data validation worksheets.

1
SAMPLE CROSS REFERENCE TABLE
SAMPLE DELIVERY GROUP TC103, U1040

Sample ID	Matrix	Date Collected	Quality Control ID	Full Validation	ANALYSES			
					P B	S V O C	O C / P C B	M E T A L S
S10	SOIL	12/28/93		*FULL		X	X	*X
S12	SOIL	12/28/93				X	X	X
S13	SOIL	12/28/93	*MS/MSD			X	*X	X
S16	SOIL	12/28/93				X	X	X
S17	SOIL	12/28/93		*FULL		*X	X	X
S19	SOIL	12/28/93		*FULL	*X			
S21	SOIL	12/28/93		*FULL		X	*X	X
S22	SOIL	12/28/93				X	X	X
S23	SOIL	12/28/93		*FULL	*X			
S24	SOIL	12/28/93		*FULL		X	*X	X
S25	SOIL	12/28/93		*FULL	*X			
S26	SOIL	12/28/93				X	X	X
S27	SOIL	12/28/93				X	X	X
S28	SOIL	12/28/93		*FULL	*X			
S29	SOIL	12/28/93		*FULL		*X	X	*X
S31	SOIL	12/28/93				X	X	X
S34	SOIL	12/28/93				X	X	X
S35	SOIL	12/28/93				X	X	X
S37	SOIL	12/28/93	*MS/MSD/DU			*X	X	*X
S39	SOIL	12/28/93				X	X	X

PB = Total lead
SVOC = Semivolatile Organic Compounds
OC/PCB = Organochlorine Pesticides/Polychlorinated biphenyls

MS/MSD = Matrix Spike/Matrix Spike Duplicate
DU = Duplicate
* = performed on indicated parameters only

SAMPLE CROSS REFERENCE TABLE
SAMPLE DELIVERY GROUP TC103, U1040

Sample ID	Matrix	Date Collected	Quality Control ID	Full Validation	ANALYSES			
					P B	S V O C	O C P C B	M E T A L S
S40	SOIL	12/28/93				X	X	X
S41	SOIL	12/28/93	*MS/DU	*FULL	*X			
S42	SOIL	12/28/93				X	X	X

PB = Total lead
 SVOC = Semivolatile Organic Compounds
 OC/PCB = Organochlorine Pesticides/Polychlorinated biphenyls

MS/MSD = Matrix Spike/Matrix Spike Duplicate
 DU = Duplicate
 * = performed on indicated parameters only

2.0 DATA VALIDATION REQUIREMENTS

All items listed are evaluated for the full validation review. cursory review items are indicated by a single asterisk (*).

CLP Inorganics (Functional Guidelines for Evaluating Inorganics)

- * Holding times
- * Calibration (initial and continuing)
- * Blanks (method, instrument, and preparation blanks)
- Inductively coupled plasma (ICP) interference check sample
- * Laboratory control sample
- * Duplicate sample analysis
- * Matrix spike sample analysis
- Graphite furnace atomic absorption (GFAA) quality control
- * ICP serial dilution
- Sample result verification
- * Field duplicates
- * Overall assessment of data for a sample delivery group

CLP Organics (National Functional Guidelines for Organic Data Review)

- * Holding times
- Gas Chromatograph/mass spectrometer (GC/MS) instrument performance check
- * Calibration (initial and continuing)
- * Blanks (method, instrument, and preparation blanks)
- * Surrogate recovery
- * Matrix spike/matrix spike duplicate
- * Field duplicates
- * Internal standard performance
- Target compound identification
- Tentatively identified compounds
- System performance
- * Overall assessment of data for a sample delivery group

Non-CLP Organic and Inorganic Parameters

- * Method Compliance
- * Holding times
- * Calibration (initial and continuing)
- * Blanks (method, instrument, and preparation blanks)
- * Surrogate recovery
- * Sample duplicates, matrix spikes, matrix spike duplicates, blank spikes
- * Other laboratory quality control specified by the method
- * Field duplicates
- Compound identification
- Compound quantitation
- * Overall assessment of data for a sample delivery group

3.0 GLOSSARY OF DATA QUALIFIERS

The following data qualifiers are used in this data validation report. The definitions for those qualifiers are consistent with "National Functional Guidelines for Organic Data Review" (December 1990) and "Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses" (July 1988).

- No Qualifier - Indicates that the data are acceptable both qualitatively and quantitatively.
- U - Indicates compound was analyzed for but not detected above the concentration listed. The value listed is the sample quantitation limit.
- J - Indicates an estimated concentration value. The result is considered qualitatively acceptable, but quantitatively unreliable.
- UJ - Indicates an estimated quantitation limit. The compound was analyzed for, but was considered non-detected.
- R - The data are unusable (compound may or may not be present). Resampling and reanalysis is necessary for verification.
- N - Indicates presumptive evidence of presence of the compound.

4.0 DATA ASSESSMENT

Analytical results were reviewed for the criteria listed in Section 2.0. A discussion of the data is presented below by methodology.

SEMIVOLATILES (CLP)

I. DELIVERABLES

The deliverables for sample delivery group (SDG) TC103 were complete.

II. HOLDING TIMES

The 14-day extraction and the 40-day analyses holding times were met.

III. GC/MS INSTRUMENT PERFORMANCE CHECK

The tuning criteria associated with all standards and the samples selected for full validation were reviewed. All instrument tune criteria were within acceptance limits.

IV. CALIBRATIONS

Due to initial calibration problems, the following compounds were qualified estimated non-detected (UJ).

- 4-chloroaniline and 3-nitroaniline in samples S10, S12, S13, S16, S17, S21, S22, S24, S26, S27, S29, S31, S34, S35, S37, S39, S40, and S42

The percent relative standard deviation (%RSD) for 4-chloroaniline and 3-nitroaniline was 30.2 percent and 55.0 percent, respectively.

Due to continuing calibration problems, the following non-detected analytes are considered estimated (UJ) and usable for limited purposes.

- carbazole in samples S10, S12, S13, S16, S17, S21, S22, S24, S26, S27, S29, S31, S34, S35, S37, S39, S40, and S42
- 2,2'-oxybis(1-chloropropane), 2-nitroaniline and 3,3'-dichlorobenzidine in samples S12, S13, S17, S21, S26, S27, S29, S31, S34, S35, S37, S39, S40, and S42
- 2,4-dinitrophenol and N-nitrosodiphenylamine in samples S17, S21, S26, S27, S29, S31, S34, S35, S39, S40, and S42
- hexachlorocyclopentadiene in samples S10, S16, S17, S21, S22, S24, S26, S27, S29, S31, S34, S35, S39, S40, and S42

The continuing calibration %D was outside the control limit of ± 25 percent as indicated below.

<u>Compound</u>	<u>Date</u>	<u>% D</u>
2,2'-oxybis(1-chloropropane)	01/25/94	33.9%
	01/29/94	28.5%
2-nitroaniline	01/25/94	28.3%
	01/29/94	26.8%
carbazole	01/25/94	41.0%
	01/27/94	51.0%
	01/28/94	54.0%
	01/29/94	39.6%
3,3'-dichlorobenzidine	01/25/94	43.1%
	01/29/94	37.6%
hexachloropentadiene	01/27/94	32.8%
	01/28/94	40.0%
	01/29/94	37.6%
2,4-dinitrophenol	01/29/94	27.0%
N-nitrosodiphenylamine	01/29/94	29.2%

V. BLANKS

Due to blank contamination problems, the following analytes are considered estimated non-detected (UJ), and usable for limited purposes only.

- Bis(2-ethylhexyl)phthalate in samples S10, S17, S27, S34, and S37
- Di-n-butylphthalate in samples S17, S35 and S39
- Butylbenzylphthalate in samples S10, S21, S24, S26, S27, S29, S35, S40 and S42

Bis(2-ethylhexyl)phthalate was found in the method blank at a concentration of 30 $\mu\text{g/Kg}$. For all phthalates, detected sample results less than 10 times the contract required detection limits (CRDL) were qualified. Although some phthalates were not detected in some of the associated blanks, they are considered common laboratory contaminants when found at low levels in environmental samples.

VI. SURROGATE RECOVERY

All surrogate recoveries were within control limits.

VII. MATRIX SPIKE/MATRIX SPIKE DUPLICATES

A matrix spike/matrix spike duplicate analysis was performed on sample S37. All percent recoveries and relative percent differences were within quality control limits.

VIII. FIELD DUPLICATES

No field duplicates were collected for semivolatile analyses.

IX. INTERNAL STANDARD PERFORMANCE

All internal standard responses and retention times were within specified control limits.

X. TARGET COMPOUND IDENTIFICATION

Target compound identification is reviewed during full validation. Samples S17 and S29 were reviewed for the full validation criteria. The target compounds and their concentrations are detailed in the following table.

SAMPLE S-17

<u>Compound</u>	<u>Concentration ($\mu\text{g/Kg}$)</u>
Phenanthrene	260
Fluoranthene	600
Pyrene	840
Benzo(a)anthracene	280
Chrysene	330
Benzo(b)fluoranthene	320
Benzo(k)fluoranthene	300
Benzo(a)pyrene	380

SAMPLE S-29

<u>Compound</u>	<u>Concentration ($\mu\text{g/Kg}$)</u>
Phenanthrene	260
Fluoranthene	900
Pyrene	960
Benzo(a)anthracene	830
Chrysene	830
Benzo(b)fluoranthene	810
Benzo(k)fluoranthene	490
Benzo(a)pyrene	530

The identification of the target compounds was verified using the retention time and the mass spectral data. The compounds were correctly identified.

XI. COMPOUND QUANTITATION AND REPORTED DETECTION LIMITS

The quantitations of target compounds were found to be correct. Quantitation limits were correctly reported and adjusted for moisture content and dilution factors.

XII. TENTATIVELY IDENTIFIED COMPOUNDS

Tentatively identified compounds were reviewed during full validation of samples S17 and S29. In both samples there was a pattern of unknown hydrocarbons.

XIII. SYSTEM PERFORMANCE

No signs of degraded instrument performance were observed. The analytical system was judged to have been in tune, within control, and stable during the course of these analyses.

XIV. OVERALL ASSESSMENT OF DATA

There were several compounds qualified due to calibration problems. Target compounds and tentatively identified compounds were detected in several samples.

With the above qualifications, the data are acceptable as noted.

PESTICIDES/PCB (CLP)

I. DELIVERABLES

The data package for SDG TC103 was complete.

II. HOLDING TIMES

The 14-day extraction and the 40-day analysis holding times were met.

III. PESTICIDE INSTRUMENT PERFORMANCE

The resolution check mixture was analyzed with each initial calibration and the resolution was acceptable.

The performance evaluation mixture (PEM) was analyzed at the correct frequency and sequence. The resolution, retention times, RPD and percent breakdown for 4,4'-DDT and endrin met the quality control criteria.

IV. CALIBRATION

The initial calibration standards (individual standard mixtures and multi-component standards) were analyzed at the proper frequency and concentrations. The peak resolution, retention times, and the %RSD for the calibration all met the quality control criteria.

The continuing calibration standards (PEM, midpoint individual standard mixtures) were analyzed at the proper frequency and concentration. The RPD of the individual standard mixtures' true and calculated amount, the peak resolution, and the retention times all met the quality control criteria.

V. BLANKS

Preparation blanks were free from target compound contamination. Instrument blanks were analyzed at the proper frequency and did not contain target compound contamination above one half the quantitation limit. No qualifications were necessary based on method blank results.

VI. SURROGATE RECOVERY

Due to surrogate recovery problems, the following detected and non-detected analytes are considered estimated (J, UJ).

- All pesticides and PCBs in sample S17
- alpha-BHC, beta-BHC, delta-BHC, lindane, heptachlor, aldrin, heptachlor epoxide, endosulfan I in samples S35, S37, S39, S40, and S42
- methoxychlor, endrin ketone, endrin aldehyde, alpha-chlordane, gamma-chlordane, toxaphene, and all Aroclors in sample S34

The percent recoveries (%R) of the surrogates decachlorobiphenyl (DCB) and tetrachloro-m-xylene (TCX) were outside the advisory limits of 60 to 150 percent recovery. The percent recoveries for TCX and DCB for each sample affected are listed below. The surrogates with an asterisk (*) exceed the acceptance criteria.

<u>Sample</u>	<u>TCX (%R)</u>		<u>DCB (%R)</u>	
	<u>Column 1</u>	<u>Column 2</u>	<u>Column 1</u>	<u>Column 2</u>
S17	*27	*28	*46	*25
S34	64	67	*326	*158
S35	*55	*56	75	74
S37	*46	*49	64	66
S39	*47	*51	*59	62
S40	*59	*54	64	61
S42	*53	*48	*56	63

All of the above samples contained many interfering peaks; sample S34 contained many late eluting peaks causing coelution interference. The semivolatile analysis confirmed the presence of hydrocarbon contaminants.

VII. MATRIX SPIKE/MATRIX SPIKE DUPLICATE

An MS/MSD analysis was performed on sample S13. All recoveries were within acceptance criteria.

VIII. FIELD DUPLICATES

Field duplicates were not submitted.

IX. PESTICIDE CLEANUP CHECKS

Florisil and gel permeation chromatography (GPC) checks were performed and all recoveries were within acceptance criteria. GPC checks were not submitted for Aroclor 1260.

X. TARGET COMPOUND IDENTIFICATION

Samples S21 and S24 were reviewed for the full validation requirements; all detected compounds were correctly identified.

XI. COMPOUND QUANTITATION AND REPORTED DETECTION LIMITS

Due to compound quantitation problems, the following compounds were qualified estimated (J) or non-detected estimated (UJ):

- endrin and gamma-chlordane in sample S13
- endosulfan II in sample S24

The RPD between the concentrations on the primary column and confirmation column was greater than the acceptance criteria of 25 percent.

Samples S21 and S24 were reviewed and all compound quantitations and reported detection limits were correctly calculated.

XII. OVERALL ASSESSMENT OF DATA

Some samples were qualified due to surrogate recovery problems and compound quantitation problems. Aroclor 1260, methoxychlor, endrin aldehyde, endrin, and 4,4'-DDD were detected in some of the samples.

No equipment rinsate or field blanks were collected. Field duplicates were not submitted.

Except for the above qualifications, the data is considered valid and usable.

METALS (CLP)

I. DELIVERABLES

The data packages for SDGs TC103 and U1040 were complete.

II. HOLDING TIMES

All holding times were met for the analysis for metals (6 months) and mercury (28 days).

III. CALIBRATION

Due to calibration problems the following analytes were qualified estimated (J) or non-detected estimated (UJ).

- beryllium in sample S27
- cadmium, cobalt, copper, nickel, silver, vanadium in samples S10, S12, S13, S16, S17, S21, S22, S24, S26, S27, S29, S31, S34, S35, S37, S39, S40, and S42
- zinc in samples S12, S13, S16, S21, S22, S31, S34, S40, and S42
- mercury in sample S17

Due to calibration problems the following non-detected analyte was qualified rejected (R).

- mercury in samples S10, S12, S13, S16, S21, S22, S24, S26, S27, S29, S31, S34, S35, S37, S39, S40, and S42

The contract required detection limit (CRDL) standard was outside the acceptance criteria of 90 to 110 percent recovery between the true and found value. Cadmium showed a low recovery in the initial CRDL (66.4%) and a high recovery in the final CRDL (107.9%). Silver showed a low recovery in both the initial CRDL (75.0%) and final CRDL (77.0%). All other analytes showed a high recovery (high bias) in the CRDL standards (113% to 131%). Only values near the CRDL were qualified.

The initial and final CRDL mercury standards showed low recoveries (55%, 45%) which is less than the criteria of 65%, indicating a severely low bias. All non-detected results were rejected (R). However, sample S17 detected mercury and therefore, the result was qualified estimated (J).

All other initial calibrations, initial calibration verifications (ICV), and continuing calibration verifications (CCV) met QC criteria.

IV. BLANKS

Due to blank contamination problems, the following analytes are considered non-detected estimated (UJ) and usable for limited purposes.

- cobalt in samples S10, S12, S13, S16, S17, S21, S22, S24, S26, S29, S31, S34, S35, S37, S39, S40, and S42
- potassium in samples S10, S12, S13, S16, S17, S21, S24, S26, S31, S34, S35, S37, S39, S40, S42
- selenium in sample S17
- sodium samples S10, S13, S16, S21, S22

Contaminants were found at the following concentrations (all calibration blank units have been converted to mg/kg units):

<u>Constituent</u>	<u>Blank Type</u>	<u>Concentration</u>
cobalt	CC	-1.28
cobalt	PB	-1.38
potassium	CC	238
selenium	CC	0.16
sodium	CC	23
sodium	PB	8.18

CC - continuing calibration blank

PB - preparation blank

V. ICP INTERFERENCE CHECK SAMPLE (ICS)

All QC criteria were met for the ICP interference check samples.

VI. LABORATORY CONTROL SAMPLES (LCS)

Solid LCS samples were analyzed and recoveries for all analytes fell within the control limits.

VII. DUPLICATE SAMPLE ANALYSIS

Duplicate analyses were performed on samples S37 and S41. All RPDs were within the acceptance criteria. The duplicate sample for S41 was analyzed by the method of standard additions. No results were qualified due to precision problems.

VIII. MATRIX SPIKE SAMPLE ANALYSIS

Matrix spike analyses were performed on samples S37 and S41.

Due to matrix spike recovery problems, the following non-detected analytes are considered estimated (UJ).

- antimony in samples S10, S12, S13, S16, S17, S21, S22, S24, S26, S27, S29, S31, S34, S35, S37, S39, S40, S42

Due to matrix spike recovery problems, the following detected analytes are considered estimated (J).

- lead in samples S10, S12, S13, S16, S17, S21, S22, S24, S26, S27, S31, S34, S35, S37, S39, S40, S42

The matrix spike recovery in sample S37 for antimony was 70.4% and the matrix spike recovery for lead in sample S37 was 129.3%; both exceeded the control limit of 75 to 125 percent. Sample S29 was not qualified for lead analysis because the sample was also analyzed by the method of standard additions.

IX. ICP SERIAL DILUTION ANALYSIS

A serial dilution was performed for ICP analysis on sample S37. The percent differences between the original analysis and the diluted samples were all less than 10 percent for those analytes whose concentrations were greater than 50 times the IDL. No qualifications were necessary based on serial dilution results.

X. FURNACE ATOMIC ABSORPTION QUALITY CONTROL

Samples S10, S19, S23, S25, S28, S29, S41 were reviewed for full validation criteria. All post digestion spike recoveries met the acceptance criteria, except arsenic in sample S10 and lead in sample S29, which were then analyzed by the method of standard additions. No results were qualified.

In addition, arsenic in sample S17, and selenium in samples S12, S16, and S21 were analyzed by the method of standard additions.

XI. FIELD DUPLICATES

No samples were submitted as field duplicates.

XII. SAMPLE RESULT VERIFICATION AND QUANTITATION

Samples S10, S19, S23, S25, S28, S29, S41 were reviewed for the full validation requirements. Several quantitations were checked and were found to be performed correctly.

Analytes detected at levels below the CRDL were consequently qualified as estimated (J).

XIII. OVERALL ASSESSMENT OF DATA

Beryllium, cadmium, cobalt, copper, mercury, nickel, silver, vanadium, and zinc were qualified in several samples due to calibration problems with the CRDL standard. Mercury was rejected in all samples except sample S17 due to calibration problems with the CRDL standard and those results are considered not usable.

Cobalt, potassium, selenium, and sodium were qualified in some samples due to blank contamination.

Antimony and lead were qualified in several samples due to a poor matrix spike recovery.

Except for the qualifications indicated and the rejected mercury results, all results are acceptable as reported.

SEMIVOLATILE ORGANIC ANALYSIS

Project : ALA258
 Lab. : MIDPAC ENV LAB
 Reviewer : TC103
 Date : 02/09/94 13:20:32

Form 18C -- EPA Specification OLM 01.1.1 (format A)

Page 1

Concentrations in UG/KG Matrix: SOIL

PRC Sample ID	S10			S12				S10			S12		
Mid Pacific Labs	S10			S12				S10			S12		
Date Received	12/29/93			12/29/93				12/29/93			12/29/93		
Date Extracted	01/03/94			01/03/94				01/03/94			01/03/94		
Date Analyzed	01/27/94			01/25/94				01/27/94			01/25/94		
Compound	Result	Val	Com	Result	Val	Com	Compound	Result	Val	Com	Result	Val	Com
Phenol	350 U			370 U			2,4-Dinitrophenol	840 U			890 U		
bis(2-Chloroethyl)ether	350 U			370 U			4-Nitrophenol	840 U			890 U		
2-Chlorophenol	350 U			370 U			Dibenzofuran	350 U			370 U		
1,3-Dichlorobenzene	350 U			370 U			2,4-Dinitrotoluene	350 U			370 U		
1,4-Dichlorobenzene	350 U			370 U			Diethylphthalate	350 U			370 U		
1,2-Dichlorobenzene	350 U			370 U			4-Chlorophenyl-phenylether	350 U			370 U		
2-Methylphenol	350 U			370 U			Fluorene	350 U			370 U		
2,2'-oxybis(1-Chloropropane)	350 U			370 UJ	F		4-Nitroaniline	840 U			890 U		
4-Methylphenol	350 U			370 U			4,6-Dinitro-2-methylphenol	840 U			890 U		
N-Nitroso-di-n-propylamine	350 U			370 U			N-Nitrosodiphenylamine (1)	350 U			370 U		
Hexachloroethane	350 U			370 U			4-Bromophenyl-phenylether	350 U			370 U		
Nitrobenzene	350 U			370 U			Hexachlorobenzene	350 U			370 U		
Isophorone	350 U			370 U			Pentachlorophenol	840 U			890 U		
2-Nitrophenol	350 U			370 U			Phenanthrene	350 U			370 U		
2,4-Dimethylphenol	350 U			370 U			Anthracene	350 U			370 U		
bis(2-Chloroethoxy)methane	350 U			370 U			Carbazole	350 UJ	F		370 UJ	F	
2,4-Dichlorophenol	350 U			370 U			Di-n-butylphthalate	350 U			370 U		
1,2,4-Trichlorobenzene	350 U			370 U			Fluoranthene	350 U			370 U		
Naphthalene	350 U			370 U			Pyrene	350 U			370 U		
4-Chloroaniline	350 UJ	F		370 UJ	F		Butylbenzylphthalate	350 UJ	B		370 U		
Hexachlorobutadiene	350 U			370 U			3,3'-Dichlorobenzidine	350 U			370 UJ	F	
4-Chloro-3-methylphenol	350 U			370 U			Benzo(a)anthracene	350 U			370 U		
2-Methylnaphthalene	350 U			370 U			Chrysene	350 U			370 U		
Hexachlorocyclopentadiene	350 UJ	F		370 U			bis(2-Ethylhexyl)phthalate	550 UJ	B		370 U		
2,4,6-Trichlorophenol	350 U			370 U			Di-n-octylphthalate	350 U			370 U		
2,4,5-Trichlorophenol	840 U			890 U			Benzo(b)fluoranthene	350 U			370 U		
2-Chloronaphthalene	350 U			370 U			Benzo(k)fluoranthene	350 U			370 U		
2-Nitroaniline	840 U			890 UJ	F		Benzo(a)pyrene	350 U			370 U		
Dimethylphthalate	350 U			370 U			Indeno(1,2,3-cd)pyrene	350 U			370 U		
Acenaphthylene	350 U			370 U			Dibenz(a,h)anthracene	350 U			370 U		
2,6-Dinitrotoluene	350 U			370 U			Benzo(g,h,i)perylene	350 U			370 U		
3-Nitroaniline	840 UJ	F		890 UJ	F								
Acenaphthene	350 U			370 U									

Validity (Val):

U - Non-detected
 UJ - Non-detected estimated
 R - Rejected
 J - Estimated concentration

NA - Not analyzed

Applicable Comments (Com):

A - Surrogate recovery problems
 B - Blank contamination problems
 C - Matrix spike recovery problems
 D - Duplicate (precision) problems
 E - Internal standard problems
 F - Calibration problems
 G - Quantification below reporting limit
 H - Other problems, refer to data validation narrative

SEMIVOLATILE ORGANIC ANALYSIS

Project : ALA258
 Lab. : MIDPAC ENV LAB
 Reviewer : TC103
 Date : 02/08/94 10:52:05

Form 1BC -- EPA Specification OLM 01.1.1 (format A)

Page 2

Concentrations in UG/KG Matrix: SOIL

PRC Sample ID	S13	S16		S13	S16		S13	S16		S13	S16		
Mid Pacific Labs	S13	S16		S13	S16		S13	S16		S13	S16		
Date Received	12/29/93	12/29/93		12/29/93	12/29/93		12/29/93	12/29/93		12/29/93	12/29/93		
Date Extracted	01/03/94	01/03/94		01/03/94	01/03/94		01/03/94	01/03/94		01/03/94	01/03/94		
Date Analyzed	01/25/94	01/28/94		01/25/94	01/28/94		01/25/94	01/28/94		01/25/94	01/28/94		
Compound	Result	Val	Com	Result	Val	Com	Compound	Result	Val	Com	Result	Val	Com
Phenol	370 U			360 U			2,4-Dinitrophenol	890 U			880 U		
bis(2-Chloroethyl)ether	370 U			360 U			4-Nitrophenol	890 U			880 U		
2-Chlorophenol	370 U			360 U			Dibenzofuran	370 U			360 U		
1,3-Dichlorobenzene	370 U			360 U			2,4-Dinitrotoluene	370 U			360 U		
1,4-Dichlorobenzene	370 U			360 U			Diethylphthalate	370 U			360 U		
1,2-Dichlorobenzene	370 U			360 U			4-Chlorophenyl-phenylether	370 U			360 U		
2-Methylphenol	370 U			360 U			Fluorene	370 U			360 U		
2,2'-oxybis(1-Chloropropane)	370 UJ	F		360 U			4-Nitroaniline	890 U			880 U		
4-Methylphenol	370 U			360 U			4,6-Dinitro-2-methylphenol	890 U			880 U		
N-Nitroso-di-n-propylamine	370 U			360 U			N-Nitrosodiphenylamine (1)	370 U			360 U		
Hexachloroethane	370 U			360 U			4-Bromophenyl-phenylether	370 U			360 U		
Nitrobenzene	370 U			360 U			Hexachlorobenzene	370 U			360 U		
Isophorone	370 U			360 U			Pentachlorophenol	890 U			880 U		
2-Nitrophenol	370 U			360 U			Phenanthrene	370 U			360 U		
2,4-Dimethylphenol	370 U			360 U			Anthracene	370 U			360 U		
bis(2-Chloroethoxy)methane	370 U			360 U			Carbazole	370 UJ	F		360 UJ	F	
2,4-Dichlorophenol	370 U			360 U			Di-n-butylphthalate	370 U			360 U		
1,2,4-Trichlorobenzene	370 U			360 U			Fluoranthene	37 J	G		360 U		
Naphthalene	370 U			360 U			Pyrene	44 J	G		360 U		
4-Chloroaniline	370 UJ	F		360 UJ	F		Butylbenzylphthalate	370 U			360 U		
Hexachlorobutadiene	370 U			360 U			3,3'-Dichlorobenzidine	370 UJ	F		360 U		
4-Chloro-3-methylphenol	370 U			360 U			Benzo(a)anthracene	370 U			360 U		
2-Methylnaphthalene	370 U			360 U			Chrysene	370 U			360 U		
Hexachlorocyclopentadiene	370 U			360 UJ	F		bis(2-Ethylhexyl)phthalate	370 U			360 U		
2,4,6-Trichlorophenol	370 U			360 U			Di-n-octylphthalate	370 U			360 U		
2,4,5-Trichlorophenol	890 U			880 U			Benzo(b)fluoranthene	370 U			360 U		
2-Chloronaphthalene	370 U			360 U			Benzo(k)fluoranthene	370 U			360 U		
2-Nitroaniline	890 UJ	F		880 U			Benzo(a)pyrene	370 U			360 U		
Dimethylphthalate	370 U			360 U			Indeno(1,2,3-cd)pyrene	370 U			360 U		
Acenaphthylene	370 U			360 U			Dibenz(a,h)anthracene	370 U			360 U		
2,6-Dinitrotoluene	370 U			360 U			Benzo(g,h,i)perylene	370 U			360 U		
3-Nitroaniline	890 UJ	F		880 UJ	F								
Acenaphthene	370 U			360 U									

Validity (Val):
 U - Non-detected
 UJ - Non-detected estimated
 R - Rejected
 J - Estimated concentration

NA - Not analyzed

Applicable Comments (Com):
 A - Surrogate recovery problems
 B - Blank contamination problems
 C - Matrix spike recovery problems
 D - Duplicate (precision) problems

E - Internal standard problems
 F - Calibration problems
 G - Quantification below reporting limit
 H - Other problems, refer to data validation narrative

SEMIVOLATILE ORGANIC ANALYSIS

Project : ALA258
 Lab. : MIDPAC ENV LAB
 Reviewer : TC103
 Date : 02/08/94 12:26:07

Form 1BC -- EPA Specification OLM 01.1.1 (format A)

Page 1

Concentrations in UG/KG Matrix: SOIL

PRC Sample ID Mid Pacific Labs Date Received Date Extracted Date Analyzed				S17 S17 12/29/93 01/03/94 01/29/94				S21 S21 12/29/93 01/03/94 01/29/94				S17 S17 12/29/93 01/03/94 01/29/94				S21 S21 12/29/93 01/03/94 01/29/94			
Compound	Result	Val	Com	Compound	Result	Val	Com	Compound	Result	Val	Com	Compound	Result	Val	Com	Compound	Result	Val	Com
Phenol	740	U		Phenol	350	U		2,4-Dinitrophenol	1800	UJ	F	Phenol	740	U		2,4-Dinitrophenol	840	UJ	F
bis(2-Chloroethyl)ether	740	U		bis(2-Chloroethyl)ether	350	U		4-Nitrophenol	1800	U		bis(2-Chloroethyl)ether	740	U		4-Nitrophenol	840	U	
2-Chlorophenol	740	U		2-Chlorophenol	350	U		Dibenzofuran	740	U		2-Chlorophenol	740	U		Dibenzofuran	350	U	
1,3-Dichlorobenzene	740	U		1,3-Dichlorobenzene	350	U		2,4-Dinitrotoluene	740	U		1,3-Dichlorobenzene	740	U		2,4-Dinitrotoluene	350	U	
1,4-Dichlorobenzene	740	U		1,4-Dichlorobenzene	350	U		Diethylphthalate	740	U		1,4-Dichlorobenzene	740	U		Diethylphthalate	350	U	
1,2-Dichlorobenzene	740	U		1,2-Dichlorobenzene	350	U		4-Chlorophenyl-phenylether	740	U		1,2-Dichlorobenzene	740	U		4-Chlorophenyl-phenylether	350	U	
2-Methylphenol	740	U		2-Methylphenol	350	U		Fluorene	740	U		2-Methylphenol	740	U		Fluorene	350	U	
2,2'-oxybis(1-Chloropropane)	740	UJ	F	2,2'-oxybis(1-Chloropropane)	350	UJ	F	4-Nitroaniline	1800	U		2,2'-oxybis(1-Chloropropane)	740	UJ	F	4-Nitroaniline	840	U	
4-Methylphenol	740	U		4-Methylphenol	350	U		4,6-Dinitro-2-methylphenol	1800	U		4-Methylphenol	740	U		4,6-Dinitro-2-methylphenol	840	U	
N-Nitroso-di-n-propylamine	740	U		N-Nitroso-di-n-propylamine	350	U		N-Nitrosodiphenylamine (1)	740	UJ	F	N-Nitroso-di-n-propylamine	740	U		N-Nitrosodiphenylamine (1)	350	UJ	F
Hexachloroethane	740	U		Hexachloroethane	350	U		4-Bromophenyl-phenylether	740	U		Hexachloroethane	740	U		4-Bromophenyl-phenylether	350	U	
Nitrobenzene	740	U		Nitrobenzene	350	U		Hexachlorobenzene	740	U		Nitrobenzene	740	U		Hexachlorobenzene	350	U	
Isophorone	740	U		Isophorone	350	U		Pentachlorophenol	1800	U		Isophorone	740	U		Pentachlorophenol	840	U	
2-Nitrophenol	740	U		2-Nitrophenol	350	U		Phenanthrene	260	J	G	2-Nitrophenol	740	U		Phenanthrene	350	U	
2,4-Dimethylphenol	740	U		2,4-Dimethylphenol	350	U		Anthracene	740	U		2,4-Dimethylphenol	740	U		Anthracene	350	U	
bis(2-Chloroethoxy)methane	740	U		bis(2-Chloroethoxy)methane	350	U		Carbazole	740	UJ	F	bis(2-Chloroethoxy)methane	740	UJ	F	Carbazole	350	UJ	F
2,4-Dichlorophenol	740	U		2,4-Dichlorophenol	350	U		Di-n-butylphthalate	740	UJ	B	2,4-Dichlorophenol	740	U		Di-n-butylphthalate	350	U	
1,2,4-Trichlorobenzene	740	U		1,2,4-Trichlorobenzene	350	U		Fluoranthene	600	J	G	1,2,4-Trichlorobenzene	740	U		Fluoranthene	350	U	
Naphthalene	740	U		Naphthalene	350	U		Pyrene	840	U		Naphthalene	740	U		Pyrene	350	U	
4-Chloroaniline	740	UJ	F	4-Chloroaniline	350	UJ	F	Butylbenzylphthalate	740	U		4-Chloroaniline	740	UJ	F	Butylbenzylphthalate	350	UJ	B
Hexachlorobutadiene	740	U		Hexachlorobutadiene	350	U		3,3'-Dichlorobenzidine	740	UJ	F	Hexachlorobutadiene	740	U		3,3'-Dichlorobenzidine	350	UJ	F
4-Chloro-3-methylphenol	740	U		4-Chloro-3-methylphenol	350	U		Benzo(a)anthracene	280	J	G	4-Chloro-3-methylphenol	740	U		Benzo(a)anthracene	350	U	
2-Methylnaphthalene	740	U		2-Methylnaphthalene	350	U		Chrysene	330	J	G	2-Methylnaphthalene	740	U		Chrysene	350	U	
Hexachlorocyclopentadiene	740	UJ	F	Hexachlorocyclopentadiene	350	UJ	F	bis(2-Ethylhexyl)phthalate	740	UJ	B	Hexachlorocyclopentadiene	740	UJ	F	bis(2-Ethylhexyl)phthalate	350	UJ	
2,4,6-Trichlorophenol	740	U		2,4,6-Trichlorophenol	350	U		Di-n-octylphthalate	740	U		2,4,6-Trichlorophenol	740	U		Di-n-octylphthalate	350	U	
2,4,5-Trichlorophenol	1800	UJ	F	2,4,5-Trichlorophenol	840	U		Benzo(b)fluoranthene	320	J	G	2,4,5-Trichlorophenol	1800	UJ	F	Benzo(b)fluoranthene	350	U	
2-Chloronaphthalene	740	U		2-Chloronaphthalene	350	U		Benzo(k)fluoranthene	300	J	G	2-Chloronaphthalene	740	U		Benzo(k)fluoranthene	350	U	
2-Nitroaniline	1800	UJ	F	2-Nitroaniline	840	UJ	F	Benzo(a)pyrene	380	J	G	2-Nitroaniline	1800	UJ	F	Benzo(a)pyrene	350	U	
Dimethylphthalate	740	U		Dimethylphthalate	350	U		Indeno(1,2,3-cd)pyrene	740	U		Dimethylphthalate	740	U		Indeno(1,2,3-cd)pyrene	350	U	
Acenaphthylene	740	U		Acenaphthylene	350	U		Dibenz(a,h)anthracene	740	U		Acenaphthylene	740	U		Dibenz(a,h)anthracene	350	U	
2,6-Dinitrotoluene	740	U		2,6-Dinitrotoluene	350	U		Benzo(g,h,i)perylene	740	U		2,6-Dinitrotoluene	740	U		Benzo(g,h,i)perylene	350	U	
3-Nitroaniline	1800	UJ	F	3-Nitroaniline	840	UJ	F					3-Nitroaniline	1800	UJ	F				
Acenaphthene	740	U		Acenaphthene	350	U						Acenaphthene	740	U					

Validity (Val):

U - Non-detected
 JJ - Non-detected estimated
 R - Rejected
 J - Estimated concentration

NA - Not analyzed

Applicable Comments (Com):

A - Surrogate recovery problems
 B - Blank contamination problems
 C - Matrix spike recovery problems
 D - Duplicate (precision) problems
 E - Internal standard problems
 F - Calibration problems
 G - Quantification below reporting limit
 H - Other problems, refer to data validation narrative

**APPENDIX A – DATA VALIDATION REPORT
AND LABORATORY RESULTS**

**SEMIVOLATILE ORGANIC ANALYSES
DATED 29 JANUARY 1994
PAGES 2 AND 3**

**FINAL SITE 15 NON-TIME CRITICAL REMOVAL
ACTION, ACTION MEMORANDUM**

**THE ABOVE IDENTIFIED PAGES ARE NOT
AVAILABLE.**

**EXTENSIVE RESEARCH WAS PERFORMED BY
NAVFAC SOUTHWEST TO LOCATE THESE
PAGES. THIS PAGE HAS BEEN INSERTED AS A
PLACEHOLDER AND WILL BE REPLACED
SHOULD THE MISSING ITEMS BE LOCATED.**

QUESTIONS MAY BE DIRECTED TO:

**DIANE C. SILVA
RECORDS MANAGEMENT SPECIALIST
NAVAL FACILITIES ENGINEERING COMMAND
SOUTHWEST
1220 PACIFIC HIGHWAY
SAN DIEGO, CA 92132**

TELEPHONE: (619) 532-3676

SEMIVOLATILE ORGANIC ANALYSIS

Project : ALA258
 Lab. : MIDPAC ENV LAB
 Reviewer : TC103
 Date : 02/08/94 10:52:05

Form 18C -- EPA Specification OLM 01.1.1 (format A)

Page 4

Concentrations in UG/KG Matrix: SOIL

PRC Sample ID	S22	S24		S22	S24								
Mid Pacific Labs	S22	S24		S22	S24								
Date Received	12/29/93	12/29/93		12/29/93	12/29/93								
Date Extracted	01/03/94	01/03/94		01/03/94	01/03/94								
Date Analyzed	01/27/94	01/27/94		01/27/94	01/27/94								
Compound	Result	Val	Com	Result	Val	Com	Compound	Result	Val	Com	Result	Val	Com
Phenol	350 U			350 U			2,4-Dinitrophenol	840 U			850 U		
bis(2-Chloroethyl)ether	350 U			350 U			4-Nitrophenol	840 U			850 U		
2-Chlorophenol	350 U			350 U			Dibenzofuran	350 U			350 U		
1,3-Dichlorobenzene	350 U			350 U			2,4-Dinitrotoluene	350 U			350 U		
1,4-Dichlorobenzene	350 U			350 U			Diethylphthalate	350 U			350 U		
1,2-Dichlorobenzene	350 U			350 U			4-Chlorophenyl-phenylether	350 U			350 U		
2-Methylphenol	350 U			350 U			Fluorene	350 U			350 U		
2,2'-oxybis(1-Chloropropane)	350 U			350 U			4-Nitroaniline	840 U			850 U		
4-Methylphenol	350 U			350 U			4,6-Dinitro-2-methylphenol	840 U			850 U		
N-Nitroso-di-n-propylamine	350 U			350 U			N-Nitrosodiphenylamine (1)	350 U			350 U		
Hexachloroethane	350 U			350 U			4-Bromophenyl-phenylether	350 U			350 U		
Nitrobenzene	350 U			350 U			Hexachlorobenzene	350 U			350 U		
Isophorone	350 U			350 U			Pentachlorophenol	840 U			850 U		
2-Nitrophenol	350 U			350 U			Phenanthrene	350 U			350 U		
2,4-Dimethylphenol	350 U			350 U			Anthracene	350 U			350 U		
bis(2-Chloroethoxy)methane	350 U			350 U			Carbazole	350 UJ	F		350 UJ	F	
2,4-Dichlorophenol	350 U			350 U			Di-n-butylphthalate	350 U			350 U		
1,2,4-Trichlorobenzene	350 U			350 U			Fluoranthene	350 U			350 U		
Naphthalene	350 U			350 U			Pyrene	350 U			24 J	G	
4-Chloroaniline	350 UJ	F		350 UJ	F		Butylbenzylphthalate	350 U			350 UJ	B	
Hexachlorobutadiene	350 U			350 U			3,3'-Dichlorobenzidine	350 U			350 U		
4-Chloro-3-methylphenol	350 U			350 U			Benzo(a)anthracene	350 U			350 U		
2-Methylnaphthalene	350 U			350 U			Chrysene	350 U			350 U		
Hexachlorocyclopentadiene	350 UJ	F		350 UJ	F		bis(2-Ethylhexyl)phthalate	350 U			350 U		
2,4,6-Trichlorophenol	350 U			350 U			Di-n-octylphthalate	350 U			350 U		
2,4,5-Trichlorophenol	840 U			850 U			Benzo(b)fluoranthene	350 U			350 U		
2-Chloronaphthalene	350 U			350 U			Benzo(k)fluoranthene	350 U			350 U		
2-Nitroaniline	840 U			850 U			Benzo(a)pyrene	350 U			350 U		
Dimethylphthalate	350 U			350 U			Indeno(1,2,3-cd)pyrene	350 U			350 U		
Acenaphthylene	350 U			350 U			Dibenz(a,h)anthracene	350 U			350 U		
2,6-Dinitrotoluene	350 U			350 U			Benzo(g,h,i)perylene	350 U			350 U		
3-Nitroaniline	840 UJ	F		850 UJ	F								
Acenaphthene	350 U			350 U									

Validity (Val):

U - Non-detected
 UJ - Non-detected estimated
 R - Rejected
 J - Estimated concentration

NA - Not analyzed

Applicable Comments (Com):

A - Surrogate recovery problems
 B - Blank contamination problems
 C - Matrix spike recovery problems
 D - Duplicate (precision) problems
 E - Internal standard problems
 F - Calibration problems
 G - Quantification below reporting limit
 H - Other problems, refer to data validation narrative

SEMIVOLATILE ORGANIC ANALYSIS

Project : ALA258
 Lab. : MIDPAC ENV LAB
 Reviewer : TC103
 Date : 02/08/94 10:52:05

Form 1BC -- EPA Specification OLM 01.1.1 (format A)

Page 5

Concentrations in UG/KG Matrix: SOIL

PRC Sample ID	S26			S27			S26			S27			
Mid Pacific Labs	S26			S27			S26			S27			
Date Received	12/29/93			12/29/93			12/29/93			12/29/93			
Date Extracted	01/03/94			01/03/94			01/03/94			01/03/94			
Date Analyzed	01/29/94			01/29/94			01/29/94			01/29/94			
Compound	Result	Val	Com	Result	Val	Com	Compound	Result	Val	Com	Result	Val	Com
Phenol	350 U			340 U			2,4-Dinitrophenol	840 UJ	F		820 UJ		F
bis(2-Chloroethyl)ether	350 U			340 U			4-Nitrophenol	840 U			820 U		
2-Chlorophenol	350 U			340 U			Dibenzofuran	350 U			340 U		
1,3-Dichlorobenzene	350 U			340 U			2,4-Dinitrotoluene	350 U			340 U		
1,4-Dichlorobenzene	350 U			340 U			Diethylphthalate	350 U			340 U		
1,2-Dichlorobenzene	350 U			340 U			4-Chlorophenyl-phenylether	350 U			340 U		
2-Methylphenol	350 U			340 U			Fluorene	350 U			340 U		
2,2'-oxybis(1-Chloropropane)	350 UJ	F		340 UJ	F		4-Nitroaniline	840 U			820 U		
4-Methylphenol	350 U			340 U			4,6-Dinitro-2-methylphenol	840 U			820 U		
N-Nitroso-di-n-propylamine	350 U			340 U			N-Nitrosodiphenylamine (1)	350 UJ	F		340 UJ		F
Hexachloroethane	350 U			340 U			4-Bromophenyl-phenylether	350 U			340 U		
Nitrobenzene	350 U			340 U			Hexachlorobenzene	350 U			340 U		
Isophorone	350 U			340 U			Pentachlorophenol	840 U			820 U		
2-Nitrophenol	350 U			340 U			Phenanthrene	350 U			340 U		
2,4-Dimethylphenol	350 U			340 U			Anthracene	350 U			340 U		
bis(2-Chloroethoxy)methane	350 U			340 U			Carbazole	350 UJ	F		340 UJ		F
2,4-Dichlorophenol	350 U			340 U			Di-n-butylphthalate	350 U			340 U		
1,2,4-Trichlorobenzene	350 U			340 U			Fluoranthene	27 J	G		340 U		
Naphthalene	350 U			340 U			Pyrene	39 J	G		340 U		
4-Chloroaniline	350 UJ	F		340 UJ	F		Butylbenzylphthalate	350 UJ	B		340 UJ		B
Hexachlorobutadiene	350 U			340 U			3,3'-Dichlorobenzidine	350 UJ	F		340 UJ		F
4-Chloro-3-methylphenol	350 U			340 U			Benzo(a)anthracene	350 U			340 U		
2-Methylnaphthalene	350 U			340 U			Chrysene	350 U			340 U		
Hexachlorocyclopentadiene	350 UJ	F		340 UJ	F		bis(2-Ethylhexyl)phthalate	350 U			340 UJ		B
2,4,6-Trichlorophenol	350 U			340 U			Di-n-octylphthalate	350 U			340 U		
2,4,5-Trichlorophenol	840 U			820 U			Benzo(b)fluoranthene	350 U			340 U		
2-Chloronaphthalene	350 U			340 U			Benzo(k)fluoranthene	350 U			340 U		
2-Nitroaniline	840 UJ	F		820 UJ	F		Benzo(a)pyrene	350 U			340 U		
Dimethylphthalate	350 U			340 U			Indeno(1,2,3-cd)pyrene	350 U			340 U		
Acenaphthylene	350 U			340 U			Dibenz(a,h)anthracene	350 U			340 U		
2,6-Dinitrotoluene	350 U			340 U			Benzo(g,h,i)perylene	350 U			340 U		
3-Nitroaniline	840 UJ	F		820 UJ	F								
Acenaphthene	350 U			340 U									

Validity (Val):

U - Non-detected
 UJ - Non-detected estimated
 R - Rejected
 J - Estimated concentration

NA - Not analyzed

Applicable Comments (Com):

A - Surrogate recovery problems
 B - Blank contamination problems
 C - Matrix spike recovery problems
 D - Duplicate (precision) problems
 E - Internal standard problems
 F - Calibration problems
 G - Quantification below reporting limit
 H - Other problems, refer to data validation narrative

SEMIVOLATILE ORGANIC ANALYSIS

Project : ALA258
 Lab. : MIDPAC ENV LAB
 Reviewer : TC103
 Date : 02/08/94 10:52:05

Form 1BC -- EPA Specification OLM 01.1.1 (format A)

Page 6

Concentrations in UG/KG Matrix: SOIL

PRC Sample ID Mid Pacific Labs Date Received Date Extracted Date Analyzed				S29 S29 12/29/93 01/03/94 01/29/94				S31 S31 12/29/93 01/03/94 01/29/94				S29 S29 12/29/93 01/03/94 01/29/94				S31 S31 12/29/93 01/03/94 01/29/94			
Compound	Result	Val	Com	Result	Val	Com	Compound	Result	Val	Com	Result	Val	Com	Result	Val	Com	Result	Val	Com
Phenol	740	U		370	U		2,4-Dinitrophenol	1800	UJ	F	890	UJ	F						
bis(2-Chloroethyl)ether	740	U		370	U		4-Nitrophenol	1800	U		890	U							
2-Chlorophenol	740	U		370	U		Dibenzofuran	740	U		370	U							
1,3-Dichlorobenzene	740	U		370	U		2,4-Dinitrotoluene	740	U		370	U							
1,4-Dichlorobenzene	740	U		370	U		Diethylphthalate	740	U		370	U							
1,2-Dichlorobenzene	740	U		370	U		4-Chlorophenyl-phenylether.	740	U		370	U							
2-Methylphenol	740	U		370	U		Fluorene	740	U		370	U							
2,2'-oxybis(1-Chloropropane)	740	UJ	F	370	UJ	F	4-Nitroaniline	1800	U		890	U							
4-Methylphenol	740	U		370	U		4,6-Dinitro-2-methylphenol	1800	U		890	U							
N-Nitroso-di-n-propylamine	740	U		370	U		N-Nitrosodiphenylamine (1)	740	UJ	F	370	UJ	F						
Hexachloroethane	740	U		370	U		4-Bromophenyl-phenylether	740	U		370	U							
Nitrobenzene	740	U		370	U		Hexachlorobenzene	740	U		370	U							
Isophorone	740	U		370	U		Pentachlorophenol	1800	U		890	U							
2-Nitrophenol	740	U		370	U		Phenanthrene	260	J	G	370	U							
2,4-Dimethylphenol	740	U		370	U		Anthracene	740	U		370	U							
bis(2-Chloroethoxy)methane	740	U		370	U		Carbazole	740	UJ	F	370	UJ	F						
2,4-Dichlorophenol	740	U		370	U		Di-n-butylphthalate	740	U		370	U							
1,2,4-Trichlorobenzene	740	U		370	U		Fluoranthene	900			27	J	G						
Naphthalene	740	U		48	J	G	Pyrene	960			37	J	G						
4-Chloroaniline	740	UJ	F	370	UJ	F	Butylbenzylphthalate	740	UJ	B	370	U							
Hexachlorobutadiene	740	U		370	U		3,3'-Dichlorobenzidine	740	UJ	F	370	UJ	F						
4-Chloro-3-methylphenol	740	U		370	U		Benzo(a)anthracene	830			370	U							
2-Methylnaphthalene	740	U		370	U		Chrysene	1000			370	U							
Hexachlorocyclopentadiene	740	UJ	F	370	UJ	F	bis(2-Ethylhexyl)phthalate	740	U		370	U							
2,4,6-Trichlorophenol	740	U		370	U		Di-n-octylphthalate	740	U		370	U							
2,4,5-Trichlorophenol	1800	U		890	U		Benzo(b)fluoranthene	810			370	U							
2-Chloronaphthalene	740	U		370	U		Benzo(k)fluoranthene	490	J	G	370	U							
2-Nitroaniline	1800	UJ	F	890	UJ	F	Benzo(a)pyrene	530	J	G	370	U							
Dimethylphthalate	740	U		370	U		Indeno(1,2,3-cd)pyrene	740	U		370	U							
Acenaphthylene	740	U		370	U		Dibenz(a,h)anthracene	740	U		370	U							
2,6-Dinitrotoluene	740	U		370	U		Benzo(g,h,i)perylene	740	U		370	U							
3-Nitroaniline	1800	UJ	F	890	UJ	F													
Acenaphthene	740	U		370	U														

Validity (Val):

U - Non-detected
 UJ - Non-detected estimated
 R - Rejected
 J - Estimated concentration

NA - Not analyzed

Applicable Comments (Com):

A - Surrogate recovery problems
 B - Blank contamination problems
 C - Matrix spike recovery problems
 D - Duplicate (precision) problems
 E - Internal standard problems
 F - Calibration problems
 G - Quantification below reporting limit
 H - Other problems, refer to data validation narrative

SEMIVOLATILE ORGANIC ANALYSIS

Project : ALA258
 Lab. : MIDPAC ENV LAB
 Reviewer : TC103
 Date : 02/08/94 12:35:15

Form 1BC -- EPA Specification OLM 01.1.1 (format A)

Page 1

Concentrations in UG/KG Matrix: SOIL

PRC Sample ID	S34			S35				S34			S35		
Mid Pacific Labs	S34			S35				S34			S35		
Date Received	12/29/93			12/29/93				12/29/93			12/29/93		
Date Extracted	01/03/94			01/03/94				01/03/94			01/03/94		
Date Analyzed	01/29/94			01/29/94				01/29/94			01/29/94		
Compound	Result	Val	Com	Result	Val	Com	Compound	Result	Val	Com	Result	Val	Com
Phenol	350	U		360	U		2,4-Dinitrophenol	850	UJ	F	880	UJ	F
bis(2-Chloroethyl)ether	350	U		360	U		4-Nitrophenol	850	U		880	U	
2-Chlorophenol	350	U		360	U		Dibenzofuran	350	U		360	U	
1,3-Dichlorobenzene	350	U		360	U		2,4-Dinitrotoluene	350	U		360	U	
1,4-Dichlorobenzene	350	U		360	U		Diethylphthalate	350	U		360	U	
1,2-Dichlorobenzene	350	U		360	U		4-Chlorophenyl-phenylether	350	U		360	U	
2-Methylphenol	350	U		360	U		Fluorene	350	U		360	U	
2,2'-oxybis(1-Chloropropane)	350	UJ	F	360	UJ	F	4-Nitroaniline	850	U		880	U	
4-Methylphenol	350	U		360	U		4,6-Dinitro-2-methylphenol	850	U		880	U	
N-Nitroso-di-n-propylamine	350	U		360	U		N-Nitrosodiphenylamine (1)	350	UJ	F	360	UJ	F
Hexachloroethane	350	U		360	U		4-Bromophenyl-phenylether	350	U		360	U	
Nitrobenzene	350	U		360	U		Hexachlorobenzene	350	U		360	U	
Isophorone	350	U		360	U		Pentachlorophenol	850	U		880	U	
2-Nitrophenol	350	U		360	U		Phenanthrene	350	U		360	U	
2,4-Dimethylphenol	350	U		360	U		Anthracene	350	U		360	U	
bis(2-Chloroethoxy)methane	350	U		360	U		Carbazole	350	UJ	F	360	UJ	F
2,4-Dichlorophenol	350	U		360	U		Di-n-butylphthalate	350	U		360	UJ	B
1,2,4-Trichlorobenzene	350	U		360	U		Fluoranthene	29	J	G	27	J	G
Naphthalene	350	U		360	U		Pyrene	34	J	G	35	J	G
4-Chloroaniline	350	UJ	F	360	UJ	F	Butylbenzylphthalate	350	U		360	UJ	B
Hexachlorobutadiene	350	U		360	U		3,3'-Dichlorobenzidine	350	UJ	F	360	UJ	F
4-Chloro-3-methylphenol	350	U		360	U		Benzo(a)anthracene	350	U		360	U	
2-Methylnaphthalene	350	U		360	U		Chrysene	44	J	G	360	U	
Hexachlorocyclopentadiene	350	UJ	F	360	UJ	F	bis(2-Ethylhexyl)phthalate	350	UJ	B	360	U	
2,4,6-Trichlorophenol	350	U		360	U		Di-n-octylphthalate	350	U		360	U	
2,4,5-Trichlorophenol	850	U		880	U		Benzo(b)fluoranthene	350	U		360	U	
2-Chloronaphthalene	350	U		360	U		Benzo(k)fluoranthene	350	U		360	U	
2-Nitroaniline	850	UJ	F	880	UJ	F	Benzo(a)pyrene	350	U		360	U	
Dimethylphthalate	350	U		360	U		Indeno(1,2,3-cd)pyrene	350	U		360	U	
Acenaphthylene	350	U		360	U		Dibenz(a,h)anthracene	350	U		360	U	
2,6-Dinitrotoluene	350	U		360	U		Benzo(g,h,i)perylene	350	U		360	U	
3-Nitroaniline	850	UJ	F	880	UJ	F							
Acenaphthene	350	U		360	U								

Validity (Val):

J - Non-detected
 UJ - Non-detected estimated
 R - Rejected
 U - Estimated concentration

NA - Not analyzed

Applicable Comments (Com):

A - Surrogate recovery problems
 B - Blank contamination problems
 C - Matrix spike recovery problems
 D - Duplicate (precision) problems
 E - Internal standard problems
 F - Calibration problems
 G - Quantification below reporting limit
 H - Other problems, refer to data validation narrative

**APPENDIX A – DATA VALIDATION REPORT
AND LABORATORY RESULTS**

**SEMIVOLATILE ORGANIC ANALYSES
DATED 25 JANUARY 1994
PAGES 2 THROUGH 7**

**FINAL SITE 15 NON-TIME CRITICAL REMOVAL
ACTION, ACTION MEMORANDUM**

**THE ABOVE IDENTIFIED PAGES ARE NOT
AVAILABLE.**

**EXTENSIVE RESEARCH WAS PERFORMED BY
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QUESTIONS MAY BE DIRECTED TO:

**DIANE C. SILVA
RECORDS MANAGEMENT SPECIALIST
NAVAL FACILITIES ENGINEERING COMMAND
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SEMIVOLATILE ORGANIC ANAL

Project : ALA258
 Lab. : MIDPAC ENV LAB
 Reviewer : TC103
 Date : 02/08/94 10:52:05

Form 1BC -- EPA Specification OLM 01.1.1 (format A)

Page 8

Concentrations in UG/KG Matrix: SOIL

PRC Sample ID	S37			S39			S37			S39			
Mid Pacific Labs	S37			S39			S37			S39			
Date Received	12/29/93			12/29/93			12/29/93			12/29/93			
Date Extracted	01/03/94			01/03/94			01/03/94			01/03/94			
Date Analyzed	01/25/94			01/29/94			01/25/94			01/29/94			
Compound	Result	Val	Com	Result	Val	Com	Compound	Result	Val	Com	Result	Val	Com
Phenol	360 U			360 U			2,4-Dinitrophenol	880 U			870 UJ		F
bis(2-Chloroethyl)ether	360 U			360 U			4-Nitrophenol	880 U			870 U		
2-Chlorophenol	360 U			360 U			Dibenzofuran	360 U			360 U		
1,3-Dichlorobenzene	360 U			360 U			2,4-Dinitrotoluene	360 U			360 U		
1,4-Dichlorobenzene	360 U			360 U			Diethylphthalate	360 U			360 U		
1,2-Dichlorobenzene	360 U			360 U			4-Chlorophenyl-phenylether.	360 U			360 U		
2-Methylphenol	360 U			360 U			Fluorene	360 U			360 U		
2,2'-oxybis(1-Chloropropane)	360 UJ	F		360 UJ	F		4-Nitroaniline	880 U			870 U		
4-Methylphenol	360 U			360 U			4,6-Dinitro-2-methylphenol	880 U			870 U		
N-Nitroso-di-n-propylamine	360 U			360 U			N-Nitrosodiphenylamine (1)	360 U			360 UJ		F
Hexachloroethane	360 U			360 U			4-Bromophenyl-phenylether	360 U			360 U		
Nitrobenzene	360 U			360 U			Hexachlorobenzene	360 U			360 U		
Isophorone	360 U			360 U			Pentachlorophenol	880 U			870 U		
2-Nitrophenol	360 U			360 U			Phenanthrene	360 U			360 U		
2,4-Dimethylphenol	360 U			360 U			Anthracene	360 U			360 U		
bis(2-Chloroethoxy)methane	360 U			360 U			Carbazole	360 UJ	F		360 UJ		F
2,4-Dichlorophenol	360 U			360 U			Di-n-butylphthalate	360 U			360 UJ		B
1,2,4-Trichlorobenzene	360 U			360 U			Fluoranthene	360 U			360 U		
Naphthalene	360 U			360 U			Pyrene	360 U			360 U		
4-Chloroaniline	360 UJ	F		360 UJ	F		Butylbenzylphthalate	360 U			360 U		
Hexachlorobutadiene	360 U			360 U			3,3'-Dichlorobenzidine	360 UJ	F		360 UJ		F
4-Chloro-3-methylphenol	360 U			360 U			Benzo(a)anthracene	360 U			360 U		
2-Methylnaphthalene	360 U			360 U			Chrysene	360 U			360 U		
Hexachlorocyclopentadiene	360 U			360 UJ	F		bis(2-Ethylhexyl)phthalate	360 UJ	B		360 U		
2,4,6-Trichlorophenol	360 U			360 U			Di-n-octylphthalate	360 U			360 U		
2,4,5-Trichlorophenol	880 U			870 U			Benzo(b)fluoranthene	360 U			360 U		
2-Chloronaphthalene	360 U			360 U			Benzo(k)fluoranthene	360 U			360 U		
2-Nitroaniline	880 UJ	F		870 UJ	F		Benzo(a)pyrene	360 U			360 U		
Dimethylphthalate	360 U			360 U			Indeno(1,2,3-cd)pyrene	360 U			360 U		
Acenaphthylene	360 U			360 U			Dibenz(a,h)anthracene	360 U			360 U		
2,6-Dinitrotoluene	360 U			360 U			Benzo(g,h,i)perylene	360 U			360 U		
3-Nitroaniline	880 UJ	F		870 UJ	F								
Acenaphthene	360 U			360 U									

Validity (Val):

U - Non-detected
 UJ - Non-detected estimated
 R - Rejected
 J - Estimated concentration

NA - Not analyzed

Applicable Comments (Com):

A - Surrogate recovery problems
 B - Blank contamination problems
 C - Matrix spike recovery problems
 D - Duplicate (precision) problems
 E - Internal standard problems
 F - Calibration problems
 G - Quantification below reporting limit
 H - Other problems, refer to data validation narrative

SEMIVOLATILE ORGANIC ANAL

Project : ALA258
 Lab. : MIDPAC ENV LAB
 Reviewer : TC103
 Date : 02/08/94 12:40:22

Form 18C -- EPA Specification OLM 01.1.1 (format A)

Page 1

Concentrations in UG/KG Matrix: SOIL

PRC Sample ID	S40			S42			S40				S42		
Mid Pacific Labs	S40			S42			S40				S42		
Date Received	12/29/93			12/29/93			12/29/93				12/29/93		
Date Extracted	01/03/94			01/03/94			01/03/94				01/03/94		
Date Analyzed	01/29/94			01/29/94			01/29/94				01/29/94		
Compound	Result	Val	Com	Result	Val	Com	Compound	Result	Val	Com	Result	Val	Com
Phenol	720	U		360	U		2,4-Dinitrophenol	1700	UJ	F	870	UJ	F
bis(2-Chloroethyl)ether	720	U		360	U		4-Nitrophenol	1700	U		870	U	
2-Chlorophenol	720	U		360	U		Dibenzofuran	720	U		360	U	
1,3-Dichlorobenzene	720	U		360	U		2,4-Dinitrotoluene	720	U		360	U	
1,4-Dichlorobenzene	720	U		360	U		Diethylphthalate	720	U		360	U	
1,2-Dichlorobenzene	720	U		360	U		4-Chlorophenyl-phenylether	720	U		360	U	
2-Methylphenol	720	U		360	U		Fluorene	720	U		360	U	
2,2'-oxybis(1-Chloropropane)	720	UJ	F	360	UJ	F	4-Nitroaniline	1700	U		870	U	
4-Methylphenol	720	U		360	U		4,6-Dinitro-2-methylphenol	1700	U		870	U	
N-Nitroso-di-n-propylamine	720	U		360	U		N-Nitrosodiphenylamine (1)	720	UJ	F	360	UJ	F
Hexachloroethane	720	U		360	U		4-Bromophenyl-phenylether	720	U		360	U	
Nitrobenzene	720	U		360	U		Hexachlorobenzene	720	U		360	U	
Isophorone	720	U		360	U		Pentachlorophenol	1700	U		870	U	
2-Nitrophenol	720	U		360	U		Phenanthrene	720	U		360	U	
2,4-Dimethylphenol	720	U		360	U		Anthracene	720	U		360	U	
bis(2-Chloroethoxy)methane	720	U		360	U		Carbazole	720	UJ	F	360	UJ	F
2,4-Dichlorophenol	720	U		360	U		Di-n-butylphthalate	720	U		360	U	
1,2,4-Trichlorobenzene	720	U		360	U		Fluoranthene	720	U		360	U	
Naphthalene	720	U		360	U		Pyrene	720	U		360	U	
4-Chloroaniline	720	UJ	F	360	UJ	F	Butylbenzylphthalate	720	UJ	B	360	UJ	B
Hexachlorobutadiene	720	U		360	U		3,3'-Dichlorobenzidine	720	UJ	F	360	UJ	F
4-Chloro-3-methylphenol	720	U		360	U		Benzo(a)anthracene	720	U		360	U	
2-Methylnaphthalene	720	U		360	U		Chrysene	720	U		360	U	
Hexachlorocyclopentadiene	720	UJ	F	360	UJ	F	bis(2-Ethylhexyl)phthalate	720	U		360	U	
2,4,6-Trichlorophenol	720	U		360	U		Di-n-octylphthalate	720	U		360	U	
2,4,5-Trichlorophenol	1700	U		870	U		Benzo(b)fluoranthene	720	U		360	U	
2-Chloronaphthalene	720	U		360	U		Benzo(k)fluoranthene	720	U		360	U	
2-Nitroaniline	1700	UJ	F	870	UJ	F	Benzo(a)pyrene	720	U		360	U	
Dimethylphthalate	720	U		360	U		Indeno(1,2,3-cd)pyrene	720	U		360	U	
Acenaphthylene	720	UJ	F	360	U		Dibenz(a,h)anthracene	720	U		360	U	
2,6-Dinitrotoluene	720	U		360	U		Benzo(g,h,i)perylene	720	U		360	U	
3-Nitroaniline	1700	UJ	F	870	UJ	F							
Acenaphthene	720	U		360	U								

Validity (Val):

J - Non-detected
 UJ - Non-detected estimated
 R - Rejected
 E - Estimated concentration

NA - Not analyzed

Applicable Comments (Com):

A - Surrogate recovery problems
 B - Blank contamination problems
 C - Matrix spike recovery problems
 D - Duplicate (precision) problems
 E - Internal standard problems
 F - Calibration problems
 G - Quantification below reporting limit
 H - Other problems, refer to data validation narrative

PESTICID ANALYSIS

Project : ALA258
 Lab. : MIDPAC ENV LAB
 Reviewer : TC103
 Date : 02/09/94 15:58:06

Form 1D -- EPA Specification OLM 01.1.1 (format A)

Page 1

Concentrations in UG/KG Matrix: SOIL

PRC Sample ID	S10	S12	S13	S16	S17
Mid Pacific Labs	S10	S12	S13	S16	S17
Date Received	12/29/93	12/29/93	12/29/93	12/29/93	12/29/93
Date Extracted	12/31/93	12/31/93	12/31/93	12/31/93	12/31/93
Date Analyzed	01/22/94	01/22/94	01/22/94	01/22/94	01/22/94

Compound	Result	Val	Com	Result	Val	Com	Result	Val	Com	Result	Val	Com	Result	Val	Com
alpha-BHC	1.8 U			1.9 U			1.9 U			1.9 U			1.9 UJ		A
beta-BHC	1.8 U			1.9 U			1.9 U			1.9 U			1.9 UJ		A
delta-BHC	1.8 U			1.9 U			1.9 U			1.9 U			1.9 UJ		A
gamma-BHC (Lindane)	1.8 U			1.9 U			1.9 U			1.9 U			1.9 UJ		A
Heptachlor	1.8 U			1.9 U			1.9 U			1.9 U			1.9 UJ		A
Aldrin	1.8 U			1.9 U			1.9 U			1.9 U			1.9 UJ		A
Heptachlor epoxide	1.8 U			1.9 U			1.9 U			1.9 U			1.9 UJ		A
Endosulfan I	1.8 U			1.9 U			1.9 U			1.9 U			1.9 UJ		A
Dieldrin	3.5 U			3.7 U			3.7 U			3.6 U			3.7 UJ		A
4,4'-DDE	3.5 U			3.7 U			3.7 U			3.6 U			3.7 UJ		A
Endrin	3.5 U			3.7 U			3.9 J	H		3.6 U			3.7 UJ		A
Endosulfan II	3.5 U			3.7 U			3.7 U			3.6 U			3.7 UJ		A
4,4'-DDD	3.5 U			3.7 U			3.7 U			3.6 U			5.1 J		A
Endosulfan sulfate	3.5 U			3.7 U			3.7 U			3.6 U			3.7 UJ		A
4,4'-DDT	3.5 U			3.7 U			3.7 U			3.6 U			3.7 UJ		A
Methoxychlor	18 U			19 U			19 U			19 U			19 UJ		A
Endrin ketone	3.5 U			3.7 U			3.7 U			3.6 U			3.7 UJ		A
Endrin aldehyde	3.5 U			3.7 U			19			3.6 U			3.7 UJ		A
alpha-Chlordane	1.8 U			1.9 U			7.7			1.9 U			1.9 UJ		A
gamma-Chlordane	1.8 U			1.9 U			7.6 J	H		1.9 U			1.9 UJ		A
Toxaphene	180 U			190 U			190 U			190 U			190 UJ		A
Aroclor-1016	35 U			37 U			37 U			36 U			37 UJ		A
Aroclor-1221	71 U			74 U			74 U			74 U			75 UJ		A
Aroclor-1232	35 U			37 U			37 U			36 U			37 UJ		A
Aroclor-1242	35 U			37 U			37 U			36 U			37 UJ		A
Aroclor-1248	35 U			37 U			37 U			36 U			37 UJ		A
Aroclor-1254	35 U			37 U			37 U			36 U			37 UJ		A
Aroclor-1260	56			34 J	G		340			36 U			25 J		A,G

Validity (Val):

U - Non-detected
 UJ - Non-detected estimated
 R - Rejected
 J - Estimated concentration

NA - Not analyzed

Applicable Comments (Com):

A - Surrogate recovery problems
 B - Blank contamination problems
 C - Matrix spike recovery problems
 D - Duplicate (precision) problems

E - Internal standard problems
 F - Calibration problems
 G - Quantification below reporting limit
 H - Other problems, refer to data validation narrative

PESTICIDE ANALYSIS

Project : ALA258
 Lab. : MIDPAC ENV LAB
 Reviewer : TC103
 Date : 02/09/94 15:58:06

Form 1D -- EPA Specification OLM 01.1.1 (format A)

Page 2

Concentrations in UG/KG Matrix: SOIL

PRC Sample ID	S21			S22			S24			S26			S27		
Mid Pacific Labs	S21			S22			S24			S26			S27		
Date Received	12/29/93			12/29/93			12/29/93			12/29/93			12/29/93		
Date Extracted	12/31/93			12/31/93			12/31/93			12/31/93			12/31/93		
Date Analyzed	01/22/94			01/07/94			01/07/94			01/07/94			01/07/94		
Compound	Result	Val	Com	Result	Val	Com	Result	Val	Com	Result	Val	Com	Result	Val	Com
alpha-BHC	1.8 U			1.8 U			1.8 U			1.8 U			1.8 U		
beta-BHC	1.8 U			1.8 U			1.8 U			1.8 U			1.8 U		
delta-BHC	1.8 U			1.8 U			1.8 U			1.8 U			1.8 U		
gamma-BHC (Lindane)	1.8 U			1.8 U			1.8 U			1.8 U			1.8 U		
Heptachlor	1.8 U			1.8 U			1.8 U			1.8 U			1.8 U		
Aldrin	1.8 U			1.8 U			1.8 U			1.8 U			1.8 U		
Heptachlor epoxide	1.8 U			1.8 U			1.8 U			1.8 U			1.8 U		
Endosulfan I	1.8 U			1.8 U			1.8 U			1.8 U			1.8 U		
Dieldrin	3.5 U			3.5 U			3.5 U			3.5 U			3.4 U		
4,4'-DDE	3.5 U			3.5 U			3.5 U			3.5 U			3.4 U		
Endrin	3.5 U			3.5 U			3.5 U			3.5 U			3.4 U		
Endosulfan II	3.5 U			3.5 U			8.6 J	H		3.5 U			3.4 U		
4,4'-DDD	3.5 U			3.5 U			3.5 U			3.5 U			3.4 U		
Endosulfan sulfate	3.5 U			3.5 U			3.5 U			3.5 U			3.4 U		
4,4'-DDT	3.5 U			3.5 U			3.5 U			3.5 U			3.4 U		
Methoxychlor	18 U			18 U			18 U			18 U			18 U		
Endrin ketone	3.5 U			3.5 U			3.5 U			3.5 U			3.4 U		
Endrin aldehyde	9.5			3.5 U			8.8			3.5 U			3.4 U		
alpha-Chlordane	1.8 U			1.8 U			1.8 U			1.8 U			1.8 U		
gamma-Chlordane	1.8 U			1.8 U			1.8 U			1.8 U			1.8 U		
Toxaphene	180 U			180 U			180 U			180 U			180 U		
Aroclor-1016	35 U			35 U			35 U			35 U			34 U		
Aroclor-1221	71 U			71 U			71 U			71 U			69 U		
Aroclor-1232	35 U			35 U			35 U			35 U			34 U		
Aroclor-1242	35 U			35 U			35 U			35 U			34 U		
Aroclor-1248	35 U			35 U			35 U			35 U			34 U		
Aroclor-1254	35 U			35 U			35 U			35 U			34 U		
Aroclor-1260	240			35 U			220			35 U			34 U		

Validity (Val):

U - Non-detected
 UJ - Non-detected estimated
 R - Rejected
 J - Estimated concentration

NA - Not analyzed

Applicable Comments (Com):

A - Surrogate recovery problems
 B - Blank contamination problems
 C - Matrix spike recovery problems
 D - Duplicate (precision) problems

E - Internal standard problems
 F - Calibration problems
 G - Quantification below reporting limit
 H - Other problems, refer to data validation narrative

PESTICIDE ANALYSIS

Project : ALA258
 Lab. : MIDPAC ENV LAB
 Reviewer : TC103
 Date : 02/08/94 12:05:53

Form 1D -- EPA Specification OLM 01.1.1 (format A)

Page 1

Concentrations in UG/KG Matrix: SOIL

PRC Sample ID	S29			S31			S34			S35			S37		
Mid Pacific Labs	S29			S31			S34			S35			S37		
Date Received	12/29/93			12/29/93			12/29/93			12/29/93			12/29/93		
Date Extracted	12/31/93			12/31/93			12/31/93			12/31/93			12/31/93		
Date Analyzed	01/07/94			01/07/94			01/22/94			01/22/94			01/22/94		
Compound	Result	Val	Com	Result	Val	Com	Result	Val	Com	Result	Val	Com	Result	Val	Com
alpha-BHC	1.9 U			1.9 U			1.8 U			1.9 UJ	A		1.9 UJ	A	
beta-BHC	1.9 U			1.9 U			1.8 U			1.9 UJ	A		1.9 UJ	A	
delta-BHC	1.9 U			1.9 U			1.8 U			1.9 UJ	A		1.9 UJ	A	
gamma-BHC (Lindane)	1.9 U			1.9 U			1.8 U			1.9 UJ	A		1.9 UJ	A	
Heptachlor	1.9 U			1.9 U			1.8 U			1.9 UJ	A		1.9 UJ	A	
Aldrin	1.9 U			1.9 U			1.8 U			1.9 UJ	A		1.9 UJ	A	
Heptachlor epoxide	1.9 U			1.9 U			1.8 U			1.9 UJ	A		1.9 UJ	A	
Endosulfan I	1.9 U			1.9 U			1.8 U			1.9 UJ	A		1.9 UJ	A	
Dieldrin	3.7 U			3.7 U			3.5 U			3.6 U			3.6 U		
4,4'-DDE	3.7 U			3.7 U			3.5 U			3.6 U			3.6 U		
Endrin	3.7 U			3.7 U			3.5 U			3.6 U			3.6 U		
Endosulfan II	3.7 U			3.7 U			3.5 U			3.6 U			3.6 U		
4,4'-DDD	3.7 U			3.7 U			3.5 U			3.6 U			3.6 U		
Endosulfan sulfate	3.7 U			3.7 U			3.5 U			3.6 U			3.6 U		
4,4'-DDT	3.7 U			3.7 U			3.5 U			3.6 U			3.6 U		
Methoxychlor	19 U			19 U			18 UJ	A		19 U			19 U		
Endrin ketone	3.7 U			3.7 U			3.5 UJ	A		3.6 U			3.6 U		
Endrin aldehyde	3.7 U			3.7 U			3.5 UJ	A		3.6 U			3.6 U		
alpha-Chlordane	1.9 U			1.9 U			3.1 J	A		1.9 U			1.9 U		
gamma-Chlordane	1.9 U			1.9 U			1.8 UJ	A		1.9 U			1.9 U		
Toxaphene	190 U			190 U			180 UJ	A		190 U			190 U		
Aroclor-1016	37 U			37 U			35 UJ	A		36 U			36 U		
Aroclor-1221	75 U			74 U			71 UJ	A		74 U			74 U		
Aroclor-1232	37 U			37 U			35 UJ	A		36 U			36 U		
Aroclor-1242	37 U			37 U			35 UJ	A		36 U			36 U		
Aroclor-1248	37 U			37 U			35 UJ	A		36 U			36 U		
Aroclor-1254	37 U			37 U			35 UJ	A		36 U			36 U		
Aroclor-1260	37 U			14 J	G		35 UJ	A		10 J	G		18 J	G	

Validity (Val):

U - Non-detected
 UJ - Non-detected estimated
 R - Rejected
 J - Estimated concentration

NA - Not analyzed

Applicable Comments (Com):

A - Surrogate recovery problems
 B - Blank contamination problems
 C - Matrix spike recovery problems
 D - Duplicate (precision) problems
 E - Internal standard problems
 F - Calibration problems
 G - Quantification below reporting limit
 H - Other problems, refer to data validation narrative

PESTICIDE ANALYSIS

Project : ALA258
 Lab. : MIDPAC ENV LAB
 Reviewer : TC103
 Date : 02/09/94 13:38:51

Form 1D -- EPA Specification OLM 01.1.1 (format A)

Page 1

Concentrations in UG/KG Matrix: SOIL

PRC Sample ID Mid Pacific Labs Date Received Date Extracted Date Analyzed	S39 S39 12/29/93 12/31/93 01/22/94	S40 S40 12/29/93 12/31/93 01/22/94	S42 S42 12/29/93 12/31/93 01/08/94												
Compound	Result	Val	Com	Result	Val	Com	Result	Val	Com	Result	Val	Com	Result	Val	Com
alpha-BHC	1.8	UJ	A	1.8	UJ	A	1.8	UJ	A						
beta-BHC	1.8	UJ	A	1.8	UJ	A	1.8	UJ	A						
delta-BHC	1.8	UJ	A	1.8	UJ	A	1.8	UJ	A						
gamma-BHC (Lindane)	1.8	UJ	A	1.8	UJ	A	1.8	UJ	A						
Heptachlor	1.8	UJ	A	1.8	UJ	A	1.8	UJ	A						
Aldrin	1.8	UJ	A	1.8	UJ	A	1.8	UJ	A						
Heptachlor epoxide	1.8	UJ	A	1.8	UJ	A	1.8	UJ	A						
Endosulfan I	1.8	UJ	A	1.8	UJ	A	1.8	UJ	A						
Dieldrin	3.6	U		3.6	U		3.6	U							
4,4'-DDE	3.6	U		3.6	U		3.6	U							
Endrin	3.6	U		3.6	U		3.6	U							
Endosulfan II	3.6	U		3.6	U		3.6	U							
4,4'-DDD	3.6	U		3.6	U		3.6	U							
Endosulfan sulfate	3.6	U		3.6	U		3.6	U							
4,4'-DDT	3.6	U		3.6	U		3.6	U							
Methoxychlor	18	U		18	U		18	U							
Endrin ketone	3.6	U		3.6	U		3.6	U							
Endrin aldehyde	3.6	U		3.6	U		3.6	U							
alpha-Chlordane	1.8	U		1.8	U		1.8	U							
gamma-Chlordane	1.8	U		1.8	U		1.8	U							
Toxaphene	180	U		180	U		180	U							
Aroclor-1016	36	U		36	U		36	U							
Aroclor-1221	73	U		73	U		73	U							
Aroclor-1232	36	U		36	U		36	U							
Aroclor-1242	36	U		36	U		36	U							
Aroclor-1248	36	U		36	U		36	U							
Aroclor-1254	36	U		36	U		36	U							
Aroclor-1260	36	U		36	U		36	U							

Validity (Val):
 U - Non-detected
 UJ - Non-detected estimated
 R - Rejected
 J - Estimated concentration

NA - Not analyzed

Applicable Comments (Com):
 A - Surrogate recovery problems
 B - Blank contamination problems
 C - Matrix spike recovery problems
 D - Duplicate (precision) problems

E - Internal standard problems
 F - Calibration problems
 G - Quantification below reporting limit
 H - Other problems, refer to data validation narrative

INORGANIC ANALYSIS

Project : ALA258
 Lab. : ETC/MID PAC
 Reviewer : U1040
 Date : 02/08/94 11:42:31

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Concentrations in MG/KG Matrix: SOIL

PRC Sample ID Mid Pacific Labs Date Received	S19 XXXS19 01/06/94			S23 XXXS23 01/06/94			S25 XXXS25 01/06/94			S28 XXXS28 01/06/94			S41 XXXS41 01/06/94		
Analyte	Result	Val	Com	Result	Val	Com	Result	Val	Com	Result	Val	Com	Result	Val	Com
Aluminum															
Antimony															
Arsenic															
Barium															
Beryllium															
Cadmium															
Calcium															
Chromium															
Cobalt															
Copper															
Iron															
Lead	4.90			65.20			56.80			72.50			3.60		
Magnesium															
Manganese															
Mercury															
Nickel															
Potassium															
Selenium															
Silver															
Sodium															
Thallium															
Vanadium															
Zinc															
Cyanide															

Validity (Val):

U - Non-detected
 UJ - Non-detected estimated
 R - Rejected
 J - Estimated concentration

NA - Not analyzed

Applicable Comments (Com):

A - Surrogate recovery problems
 B - Blank contamination problems
 C - Matrix spike recovery problems
 D - Duplicate (precision) problems
 E - Internal standard problems
 F - Calibration problems
 G - Quantification below reporting limit
 H - Other problems, refer to data validation narrative

INORGANIC ANALYSIS

Project : ALA258
 Lab. : ETC/MID PAC
 Reviewer : TC103
 Date : 02/09/94 13:34:17

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Page 1

Concentrations in MG/KG Matrix: SOIL

PRC Sample ID Mid Pacific Labs Date Received	S10 XXXS10 12/29/93			S12 XXXS12 12/29/93			S13 XXXS13 12/29/93			S16 XXXS16 12/29/93			S17 XXXS17 12/29/93		
Analyte	Result	Val	Com	Result	Val	Com	Result	Val	Com	Result	Val	Com	Result	Val	Com
Aluminum	4410.00			5290.00			5670.00			4470.00			8240.00		
Antimony	6.50 UJ	C		6.90 UJ	C		6.90 UJ	C		6.80 UJ	C		6.90 UJ	C	
Arsenic	2.50			2.60			2.10 J	G		2.50			2.60		
Barium	29.50 J	G		30.80 J	G		39.60 J	G		29.60 J	G		56.00		
Beryllium	0.21 U			0.22 U			0.22 U			0.22 U			0.22 U		
Cadmium	0.84 UJ	F		0.89 UJ	F		0.88 UJ	F		0.88 UJ	F		1.60 J	F	
Calcium	2140.00			2650.00			2530.00			2380.00			5460.00		
Chromium	31.80			33.90			35.50			31.20			37.10		
Cobalt	2.70 UJ	FB		1.60 UJ	FB		2.50 UJ	FB		1.30 UJ	FB		3.30 UJ	FB	
Copper	9.00 J	F		7.20 J	F		8.40 J	F		6.30 J	F		17.90 J	F	
Iron	8190.00			8190.00			9630.00			7550.00			14400.00		
Lead	5.80 J	C		4.20 J	C		4.70 J	C		3.20 J	C		22.00 J	C	
Magnesium	2150.00			2120.00			2390.00			2060.00			4020.00		
Manganese	120.00			99.20			186.00			99.30			240.00		
Mercury	0.11 R	F		0.11 R	F		0.11 R	F		0.11 R	F		0.56 J	F	
Nickel	27.60 J	F		26.60 J	F		32.70 J	F		26.20 J	F		31.60 J	F	
Potassium	627.00 UJ	B		724.00 UJ	B		737.00 UJ	B		583.00 UJ	B		999.00 UJ	B	
Selenium	0.63 U			0.76 J	G		0.66 U			0.92 J	G		0.84 UJ	B	
Silver	0.42 UJ	F		0.44 UJ	F		0.44 UJ	F		0.44 UJ	F		0.45 UJ	F	
Sodium	79.40 UJ	B		140.00 J	G		109.00 UJ	B		99.20 UJ	B		418.00 J	G	
Thallium	0.63 U			0.67 U			0.66 U			0.66 U			0.67 U		
Vanadium	18.60 J	F		21.50 J	F		22.60 J	F		18.60 J	F		28.50 J	F	
Zinc	60.00			25.40 J	F		21.60 J	F		18.40 J	F		90.40		
Cyanide															

Validity (Val):

U - Non-detected
 UJ - Non-detected estimated
 R - Rejected
 J - Estimated concentration

NA - Not analyzed

Applicable Comments (Com):

A - Surrogate recovery problems
 B - Blank contamination problems
 C - Matrix spike recovery problems
 D - Duplicate (precision) problems
 E - Internal standard problems
 F - Calibration problems
 G - Quantification below reporting limit
 H - Other problems, refer to data validation narrative

INORGANIC ANALYSIS

Project : ALA258
 Lab. : ETC/MID PAC
 Reviewer : TC103
 Date : 02/09/94 13:34:17

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Concentrations in MG/KG Matrix: SOIL

PRC Sample ID Mid Pacific Labs Date Received	S21 XXXS21 12/29/93			S22 XXXS22 12/29/93			S24 XXXS24 12/29/93			S26 XXXS26 12/29/93			S27 XXXS27 12/29/93		
Analyte	Result	Val	Com	Result	Val	Com	Result	Val	Com	Result	Val	Com	Result	Val	Com
Aluminum	4420.00			6640.00			5950.00			6070.00			11800.00		
Antimony	6.50 UJ	C		6.50 UJ	C		6.60 UJ	C		6.50 UJ	C		6.40 UJ	C	
Arsenic	2.20			4.80			3.30			2.90			5.30		
Barium	31.00 J	G		42.20			41.60 J	G		38.80 J	G		69.00		
Beryllium	0.21 U			0.21 U			0.21 U			0.21 U			0.32 J	FG	
Cadmium	0.84 UJ	F		0.84 UJ	F		0.85 UJ	F		0.84 UJ	F		0.83 UJ	F	
Calcium	2140.00			2720.00			3260.00			2640.00			4240.00		
Chromium	32.30			32.90			32.80			32.40			46.80		
Cobalt	2.30 UJ	FB		3.10 UJ	FB		2.50 UJ	FB		2.70 UJ	FB		7.20 J	FG	
Copper	6.00 J	F		10.00 J	F		10.90 J	F		10.40 J	F		25.30 J	F	
Iron	8300.00			11700.00			9960.00			9890.00			23500.00		
Lead	4.70 J	C		7.00 J	C		15.00 J	C		13.50 J	C		9.80 J	C	
Magnesium	2300.00			4370.00			2490.00			2750.00			9750.00		
Manganese	117.00			204.00			136.00			131.00			306.00		
Mercury	0.11 R	F		0.10 R	F		0.11 R	F		0.11 R	F		0.10 R	F	
Nickel	27.50 J	F		40.30 J	F		29.00 J	F		31.30 J	F		59.60 J	F	
Potassium	569.00 UJ	B		933.00 UJ	B		784.00 UJ	B		901.00 UJ	B		1250.00		
Selenium	1.20			0.63 U			0.64 U			0.63 U			0.62 U		
Silver	0.42 UJ	F		0.42 UJ	F		0.42 UJ	F		0.42 UJ	F		0.41 UJ	F	
Sodium	89.00 UJ	B		105.00 UJ	B		166.00 J	G		168.00 J	G		441.00 J	G	
Thallium	0.63 U			0.63 U			0.64 U			0.63 U			0.62 U		
Vanadium	19.20 J	F		21.40 J	F		25.00 J	F		22.00 J	F		38.20 J	F	
Zinc	19.70 J	F		28.00 J	F		38.50			82.20			49.50		
Cyanide															

Validity (Val):

U - Non-detected
 UJ - Non-detected estimated
 R - Rejected
 J - Estimated concentration

NA - Not analyzed

Applicable Comments (Com):

A - Surrogate recovery problems
 B - Blank contamination problems
 C - Matrix spike recovery problems
 D - Duplicate (precision) problems
 E - Internal standard problems
 F - Calibration problems
 G - Quantification below reporting limit
 H - Other problems, refer to data validation narrative

Project : ALA258
 Lab. : ETC/MID PAC
 Reviewer : TC103
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Concentrations in MG/KG Matrix: SOIL

PRC Sample ID Mid Pacific Labs Date Received	S29 XXXS29 12/29/93			S31 XXXS31 12/29/93			S34 XXXS34 12/29/93			S35 XXXS35 12/29/93			S37 XXXS37 12/29/93		
Analyte	Result	Val	Com	Result	Val	Com	Result	Val	Com	Result	Val	Com	Result	Val	Com
Aluminum	5800.00			4480.00			5090.00			3900.00			3870.00		
Antimony	7.00 UJ		C	6.90 UJ		C	6.60 UJ		C	6.80 UJ		C	6.80 UJ		C
Arsenic	2.20 J		G	1.70 J		G	2.10 J		G	1.90 J		G	1.90 J		G
Barium	55.10			25.40 J		G	29.00 J		G	22.60 J		G	34.00 J		G
Beryllium	0.23 U			0.22 U			0.21 U			0.22 U			0.22 U		
Cadmium	0.90 UJ		F	0.89 UJ		F	0.85 UJ		F	0.88 UJ		F	1.30 J		F
Calcium	4170.00			2790.00			2760.00			2380.00			1920.00		
Chromium	34.40			28.30			34.30			24.80			26.70		
Cobalt	2.50 UJ		FB	2.50 UJ		FB	2.90 UJ		FB	1.50 UJ		FB	1.60 UJ		FB
Copper	11.20 J		F	6.40 J		F	5.70 J		F	5.10 J		FG	6.50 J		F
Iron	9960.00			7780.00			8940.00			7140.00			7370.00		
Lead	32.90			5.80 J		C	44.70 J		C	3.10 J		C	3.70 J		C
Magnesium	2140.00			1950.00			2120.00			1750.00			2010.00		
Manganese	139.00			86.30			117.00			84.40			90.60		
Mercury	0.11 R		F	0.11 R		F	0.11 R		F	0.11 R		F	0.11 R		F
Nickel	29.50 J		F	26.30 J		F	32.10 J		F	23.80 J		F	24.40 J		F
Potassium	1170.00			828.00 UJ		B	757.00 UJ		B	740.00 UJ		B	624.00 UJ		B
Selenium	0.68 U			0.67 U			0.64 U			0.66 U			0.66 U		
Silver	0.45 UJ		F	0.45 UJ		F	0.43 UJ		F	0.44 UJ		F	0.44 UJ		F
Sodium	193.00 J		G	138.00 J		G	149.00 J		G	129.00 J		G	122.00 J		G
Thallium	0.68 U			0.67 U			0.64 U			0.66 U			0.66 U		
Vanadium	23.40 J		F	17.00 J		F	21.60 J		F	16.10 J		F	17.40 J		F
Zinc	39.60			28.00 J		F	21.70 J		F	1640.00			37.70		
Cyanide															

Validity (Val):

U - Non-detected
 UJ - Non-detected estimated
 R - Rejected
 J - Estimated concentration

NA - Not analyzed

Applicable Comments (Com):

A - Surrogate recovery problems
 B - Blank contamination problems
 C - Matrix spike recovery problems
 D - Duplicate (precision) problems

E - Internal standard problems

F - Calibration problems

G - Quantification below reporting limit

H - Other problems, refer to data validation narrative

INORGANIC ANALYSIS

Project : ALA258
 Lab. : ETC/MID PAC
 Reviewer : TC103
 Date : 02/09/94 13:34:17

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Concentrations in MG/KG Matrix: SOIL

PRC Sample ID Mid Pacific Labs Date Received	S39 XXXS39 12/29/93			S40 XXXS40 12/29/93			S42 XXXS42 12/29/93								
Analyte	Result	Val	Com	Result	Val	Com	Result	Val	Com	Result	Val	Com	Result	Val	Com
Aluminum	5820.00			6560.00			4350.00								
Antimony	6.70 UJ		C	6.70 UJ		C	6.80 UJ		C						
Arsenic	2.10 J		G	2.00 J		G	2.00 J		G						
Barium	60.40			39.00 J		G	19.20 J		G						
Beryllium	0.22 U			0.22 U			0.22 U								
Cadmium	0.87 UJ		F	0.86 UJ		F	0.87 UJ		F						
Calcium	4290.00			2840.00			3150.00								
Chromium	28.10			44.50			30.20								
Cobalt	1.70 UJ		FB	3.00 UJ		FB	2.80 UJ		FB						
Copper	8.30 J		F	9.90 J		F	4.80 J		FG						
Iron	8530.00			11000.00			8270.00								
Lead	39.70 J		C	5.10 J		C	2.40 J		C						
Magnesium	1980.00			3380.00			2170.00								
Manganese	143.00			195.00			130.00								
Mercury	0.11 R		F	0.11 R		F	0.11 R		F						
Nickel	23.00 J		F	36.20 J		F	31.00 J		F						
Potassium	863.00 UJ		B	857.00 UJ		B	503.00 UJ		B						
Selenium	0.65 U			0.65 U			0.66 U								
Silver	0.43 UJ		F	0.43 UJ		F	0.44 UJ		F						
Sodium	112.00 J		G	143.00 J		G	217.00 J		G						
Thallium	0.65 U			0.65 U			0.66 U								
Vanadium	22.00 J		F	24.10 J		F	19.60 J		F						
Zinc	41.80			23.50 J		F	17.10 J		F						
Cyanide															

Validity (Val):

U - Non-detected
 UJ - Non-detected estimated
 R - Rejected
 J - Estimated concentration

NA - Not analyzed

Applicable Comments (Com):

A - Surrogate recovery problems
 B - Blank contamination problems
 C - Matrix spike recovery problems
 D - Duplicate (precision) problems
 E - Internal standard problems
 F - Calibration problems
 G - Quantification below reporting limit
 H - Other problems, refer to data validation narrative

APPENDIX B
DETAILED COST ANALYSIS

TABLE B-1

**PRELIMINARY CAPITAL COST ESTIMATE FOR REMEDIAL ALTERNATIVE 2
EXCAVATION/ON-SITE SOIL WASHING/ON-SITE DISPOSAL
SITE 15
NAS ALAMEDA**

Item No.	Item/Description	Unit	Unit Cost	Quantity	Subtotal ⁱ	Total
<u>REMOVAL DESIGN ACTIVITIES</u>						
1	Work Plan Preparation ^a	lump sum	\$15,600	1	\$15,600	
2	Treatment System Vendor Bid Preparation and Evaluation	lump sum	\$15,000	1	\$15,000	
3	Permitting	lump sum	\$10,000	1	\$10,000	
TOTAL						\$40,600
<u>REMOVAL ACTION ACTIVITIES</u>						
4	<u>Well Destruction</u>	each	\$500	3	\$1,500	
TOTAL						\$1,500
5	<u>Soil Excavation</u>					
5a	Engineering Oversight ^b	hour	\$90	800	\$72,000	
5b	Mobilization & Demobilization	lump sum	\$10,000	1	\$10,000	
5c	Site Preparation	lump sum	\$25,000	1	\$25,000	
5d	Temporary Fence	linear foot	\$3	500	\$1,500	
5e	Excavation ^c	ton	\$30	5,300	\$159,000	
5f	Imported Fill	ton	\$6	1,060	\$6,400	
5g	Backfilling & Compaction	ton	\$30	(see item 9)		
5h	Equipment and Materials	lump sum	\$17,000	1	\$17,000	
TOTAL						\$290,900
6	<u>Postexcavation Sampling</u>					
6a	Sampling					
	Personnel ^d	hour	\$90	40	\$3,600	
	Sampling Equipment and Materials	lump sum	\$1,600	1	\$1,600	
6b	Laboratory Analysis (assumes 1 sample per approx. 850 square feet, 35-day turn around for lead and PCB analyses)	sample	\$210	62	\$13,000	
TOTAL						\$18,200

TABLE B-1

**PRELIMINARY CAPITAL COST ESTIMATE FOR REMEDIAL ALTERNATIVE 2
EXCAVATION/ON-SITE SOIL WASHING/ON-SITE DISPOSAL
SITE 15
NAS ALAMEDA
(Continued)**

Item No.	Item/Description	Unit	Unit Cost	Quantity	Subtotal ⁱ	Total
7	On-Site Soil Washing^e					
7a	Engineering Oversight	hour		(included in item 5a)		
7b	Mobilization	lump sum	\$30,000	1	\$30,000	
7c	Bench-Scale Study	lump sum	\$5,000	1	\$5,000	
7d	Soil Washing Treatment Operation	ton	\$85	5,300	\$450,500	
7e	Posttreatment Verification Sampling (composite 4 samples [1 sample per 100 cu. yds.])	composite sample	\$210	10	\$2,100	
7f	Process Water Analysis (PCBs and lead only)	sample	\$200	5	\$1,000	
	TOTAL					\$488,600
8	Well Replacement	each	\$1,000	3	\$3,000	
	TOTAL					\$3,000
9	On-Site Disposal					
9a	Backfilling & Compaction	ton	\$30	5,300	\$159,000	
	TOTAL					\$159,000
10	Off-Site Incineration^f					
10a	Waste Profile Fee	lump sum	\$550	1	\$550	
10b	Transportation (assumes 20 cu.-yd. end dump, round trip)	truck load	\$2,000	19	\$38,000	
10c	Incineration	ton	\$1,320	525	\$693,000	
10d	Incineration State Tax	ton	\$200	525	\$105,000	
	TOTAL					\$836,600
11	Closure Report^g	lump sum	\$9,800	1	\$9,800	
	TOTAL					\$9,800
	SUBTOTAL					\$1,848,200
	Contingency (20%)					\$369,600
	Project Administration (10% of Subtotal and Contingency)					\$221,800
	TOTAL CAPITAL COST^h					\$2,400,000

Assumptions:^a Site Implementation Work Plan^b Two-person crew (one professional and one technician), 33 field days, 11-hour days.^c Area to be excavated is approximately 50,000 sq. feet and 2 feet deep; 105 pounds per cubic foot soil, or 1.42 tons per cubic yard.^d Two-person crew (one professional and one technician), 4 total field days for collecting screening level and final confirmation samples.

All excavated soil will require soil washing. Costs provided by Bergman USA, Gallatin, Tennessee.

Estimated 10% of the excavated soil is concentrated residuals requiring treatment and disposal at Aptsu Incineration Facility in Utah.

^g 25-page report.^h Total capital cost is rounded to the nearest one hundred thousand dollars.ⁱ Individual costs are rounded to the nearest one hundred dollars.

TABLE B-2

**PRELIMINARY CAPITAL COST ESTIMATE FOR REMEDIAL ALTERNATIVE 3
EXCAVATION/ON-SITE SOLIDIFICATION OR STABILIZATION/ON-SITE DISPOSAL
SITE 15
NAS ALAMEDA**

Item No.	Item/Description	Unit	Unit Cost	Quantity	Subtotal ⁱ	Total
<u>REMOVAL DESIGN ACTIVITIES</u>						
1	Plan and Specification Preparation ^a	lump sum	\$15,600	1	\$15,600	
2	Treatment System Vendor Bid Preparation and Evaluation	lump sum	\$15,000	1	\$15,000	
3	Permitting	lump sum	\$10,000	1	\$10,000	
TOTAL						\$40,600
<u>REMOVAL ACTION ACTIVITIES</u>						
4	<u>Well Abandonment</u>	each	\$500	3	\$1,500	
TOTAL						\$1,500
5	<u>Soil Excavation</u>					
5a	Engineering Oversight ^b	hour	\$90	800	\$72,000	
5b	Mobilization & Demobilization	lump sum	\$10,000	1	\$10,000	
5c	Site Preparation	lump sum	\$25,000	1	\$25,000	
5d	Temporary Fence	linear foot	\$3	500	\$1,500	
5e	Excavation ^c	ton	\$30	5,300	\$159,000	
5f	Imported Fill	ton	\$6	NA		
5g	Backfilling & Compaction	ton	\$30	(see item 9)		
5h	Equipment and Materials	lump sum	\$17,000	1	\$17,000	
TOTAL						\$284,500
6	<u>Postexcavation Sampling</u>					
6a	Sampling					
	Personnel ^d	hour	\$90	40	\$3,600	
	Sampling Equipment and Materials	lump sum	\$1,600	1	\$1,600	
6b	Analyses (assumes 1 sample per approx. 850 square feet, 35-day turn around for lead and PCB analyses)	sample	\$210	62	\$13,000	
TOTAL						\$18,200

TABLE B-2

**PRELIMINARY CAPITAL COST ESTIMATE FOR REMEDIAL ALTERNATIVE 3
EXCAVATION/ON-SITE SOLIDIFICATION OR STABILIZATION/ON-SITE DISPOSAL
SITE 15
NAS ALAMEDA
(Continued)**

Item No.	Item/Description	Unit	Unit Cost	Quantity	Subtotal ⁱ	Total
7	<u>On-Site Stabilization</u> ^e					
7a	Engineering Oversight	hour		(included in item 5a)		
7b	Mobilization	lump sum	\$10,000	1	\$10,000	
7c	Bench-Scale Study	lump sum	\$5,000	1	\$5,000	
7d	Stabilization Treatment	ton	\$70	5,300	\$371,000	
7e	Posttreatment Verification Sampling (Composite 4 samples [1 sample per 100 cu. yds.])	composite sample	\$210	10	\$2,100	
	TOTAL					\$388,100
8	<u>Well Replacement</u>	each	\$1,000	1	\$1,000	
	TOTAL					\$1,000
9	<u>On-Site Disposal</u>					
9a	Backfilling and Compaction	ton	\$30	5,300	\$159,000	
	TOTAL					\$159,000
10	<u>Class I Facility Disposal</u> ^f					
10a	Predisposal Lab Analytical Testing/ Waste Profile	lump sum	\$300	1	\$300	
10b	Disposal (including transportation)	ton	\$210	1,050	\$220,500	
	TOTAL					\$220,500
11	<u>Closure Report</u> ^g	lump sum	\$9,800	1	\$9,800	
	TOTAL					\$9,800
	SUBTOTAL					\$1,123,200
	Contingency (20%)					\$224,600
	Project Administration (10% of Subtotal and Contingency)					\$134,800
	TOTAL CAPITAL COST ^h					\$1,500,000

Assumptions:^a Site Implementation Work Plan^b Two-person crew (one professional and one technician), 33 field days, 11-hour days.^c Area to be excavated is approximately 50,000 sq. feet and 2 feet deep; 105 pounds per cubic foot soil, or 1.42 tons per cubic yard.^d Two-person crew (one professional and one technician), 4 total field days for collecting screening level and final confirmation samples.^e All the excavated soil requires stabilization.^f Estimated 20% of the treated soil requires disposal at Chemical Waste Management's Kettleman Hills Class I Disposal Facility.^g 25-page report.^h Total capital cost is rounded to the nearest one hundred thousand dollars.ⁱ Individual costs are rounded to the nearest one hundred dollars.

TABLE B-3

PRELIMINARY CAPITAL COST ESTIMATE FOR REMEDIAL ALTERNATIVE 4
EXCAVATION/ON-SITE SOLVENT EXTRACTION AND STABILIZATION OR ACID WASHING/ON-SITE DISPOSAL
SITE 15
NAS ALAMEDA

Item No.	Item/Description	Unit	Unit Cost	Quantity	Subtotal ^j	Total
<u>REMOVAL DESIGN ACTIVITIES</u>						
1	Work Plan Preparation ^a	lump sum	\$15,600	1	\$15,600	
2	Treatment System Vendor Bid Preparation and Evaluation	lump sum	\$15,000	1	\$15,000	
3	Permitting	lump sum	\$10,000	1	\$10,000	
	TOTAL					\$40,600
<u>REMOVAL ACTION ACTIVITIES</u>						
4	<u>Well Destruction</u>	each	\$500	3	\$1,500	
	TOTAL					\$1,500
5	<u>Soil Excavation</u>					
5a	Engineering Oversight ^b	hour	\$90	800	\$72,000	
5b	Mobilization & Demobilization	lump sum	\$10,000	1	\$10,000	
5c	Site Preparation	lump sum	\$25,000	1	\$25,000	
5d	Temporary Fence	linear foot	\$3	500	\$1,500	
5e	Excavation ^c	ton	\$30	5,300	\$159,000	
5f	Imported Fill	ton	\$6	NA		
5g	Backfilling & Compaction	ton	\$30	(see item 9)		
5h	Equipment and Materials	lump sum	\$17,000	1	\$17,000	
	TOTAL					\$284,500
6	<u>Postexcavation Sampling</u>					
6a	Sampling					
	Personnel ^d	hour	\$90	40	\$3,600	
	Sampling Equipment and Materials	lump sum	\$1,600	1	\$1,600	
6b	Laboratory Analysis (assumes 1 sample per approx. 850 square feet, 35-day turn around for lead and PCB analyses)	sample	\$210	62	\$13,000	
	TOTAL					\$18,200

TABLE B-3

**PRELIMINARY CAPITAL COST ESTIMATE FOR REMEDIAL ALTERNATIVE 4
EXCAVATION/ON-SITE SOLVENT EXTRACTION AND STABILIZATION OR ACID WASHING/ON-SITE DISPOSAL
SITE 15
NAS ALAMEDA
(Continued)**

Item No.	Item/Description	Unit	Unit Cost	Quantity	Subtotal ^j	Total
7	<u>On-Site Solvent Extraction and Stabilization or Acid Washing</u> ^e					
7a	Engineering Oversight	hour		(included in item 5a)		
7b.1	Solvent Extraction and Stabilization					
	Bench-Scale Study	lump sum	\$18,000	1	\$18,000	
	Mobilization/Demobilization	lump sum	\$275,000	1	\$275,000	
	Solvent Extraction Treatment	ton	\$178	5,300	\$943,400	
	Stabilization Treatment	ton	\$40	2,650	\$106,000	
7b.2	Solvent Extraction and Acid Washing					
	Bench-Scale Study	lump sum	\$18,000	1	\$18,000	
	Mobilization/Demobilization	lump sum	\$275,000	1	\$275,000	
	Solvent Extraction Treatment	ton	\$178	5,300	\$943,400	
	Acid Washing Treatment	ton	\$85	2,650	\$225,300	
7c	Posttreatment Verification Sampling (composite 4 samples [1 sample per 100 cu. yds.]	composite sample	\$210	10	\$2,100	
	TOTAL (Solvent Extraction and Stabilization)					\$1,344,500
	TOTAL (Solvent Extraction and Acid Washing)					\$1,463,800
8	<u>Well Replacement</u>	each	\$1,000	3	\$3,000	
	TOTAL					\$3,000
9	<u>On-Site Disposal</u>					
9a	Backfilling & Compaction	ton	\$30	5,300	\$159,000	
	TOTAL					\$159,000
10	<u>Off-Site Incineration</u>					
10.a.1	Solvent Extraction and Stabilization ^f					
	Waste Profile Fee	lump sum	\$550	1	\$600	
	Transportation (Assume 20 cu. yd. end dump, round-trip)	truck load	\$2,000	2	\$4,000	
	Incineration	ton	\$1,320	40	\$52,800	
	Incineration State Tax	ton	\$200	40	\$8,000	

TABLE B-3

**PRELIMINARY CAPITAL COST ESTIMATE FOR REMEDIAL ALTERNATIVE 4
EXCAVATION/ON-SITE SOLVENT EXTRACTION AND STABILIZATION OR ACID WASHING/ON-SITE DISPOSAL
SITE 15
NAS ALAMEDA
(Continued)**

Item No.	Item/Description	Unit	Unit Cost	Quantity	Subtotal ^j	Total
10.a.2	Solvent Extraction and Acid Washing ^g					
	Waste Profile Fee	lump sum	\$550	1	\$600	
	Transportation (Assume 20 cu. yd. end dump, round-trip)	truck load	\$2,000	12	\$24,000	
	Incineration	ton	\$1,320	305	\$402,600	
	Incineration State Tax	ton	\$200	305	\$61,000	
	TOTAL (Solvent Extraction and Stabilization)					\$65,400
	TOTAL (Solvent Extraction and Acid Washing)					\$488,200
11	Closure Report ^h	lump sum	\$9,800	1	\$9,800	
	TOTAL					\$9,800
				Solvent Extraction and Stabilization	Solvent Extraction and Acid Washing	
	SUBTOTAL			\$1,926,500	\$2,468,600	
	Contingency (20%)			\$385,300	\$493,700	
	Project Administration (10% of Subtotal and Contingency)			\$231,200	\$296,200	
	TOTAL CAPITAL COST ⁱ			\$2,500,000	\$3,300,000	

Assumptions:^a Site Implementation Work Plan^b Two-person crew (one professional and one technician), 33 field days, 11-hour days.^c Area to be excavated is approximately 50,000 sq. feet and 2 feet deep; 105 pounds per cubic foot soil, or 1.42 tons per cubic yard.^d Two-person crew (one professional and one technician), 4 total field days for collecting screening level and final confirmation samples.^e All excavated soil will require solvent extraction; 50% will require stabilization or acid washing. Costs provided by Terra-Kleen, Oklahoma.^f Off-site incineration required for solvent extraction residuals in carbon drums at Aptus Incineration Facility in Utah. Assume 15 lbs of carbon per ton of soil (Terra-Kleen, Oklahoma).^g Off-site incineration required for solvent extraction residuals (carbon) and acid washing residuals (estimated 10% of excavated soil containing elevated lead) at Aptus Incineration Facility in Utah. Assume 15 lbs of carbon per ton of soil (Terra-Kleen, Oklahoma).^h 25-page report.ⁱ Total capital cost is rounded to the nearest one hundred thousand dollars.^j Individual costs are rounded to the nearest one hundred dollars.

TABLE B-4
PRELIMINARY CAPITAL COST ESTIMATE FOR REMEDIAL ALTERNATIVE 5
EXCAVATION/OFF-SITE INCINERATION
IMF SITE
NAS ALAMEDA

Item No.	Item/Description	Unit	Unit Cost	Quantity	Subtotal ^h	Total
<u>REMOVAL DESIGN ACTIVITIES</u>						
1	Plan and Specification Preparation ^a	lump sum	\$15,600	1	\$15,600	
2	Treatment System Vendor Bid Preparation and Evaluation	lump sum	NA			
3	Permitting	lump sum	\$5,000	1	\$5,000	
	TOTAL					\$20,600
<u>REMOVAL ACTION ACTIVITIES</u>						
4	<u>Well Destruction</u>	each	\$500	3	\$1,500	
	TOTAL					\$1,500
5	<u>Soil Excavation</u>					
5a	Engineering Oversight ^b	hour	\$90	800	\$72,000	
5b	Mobilization & Demobilization	lump sum	\$10,000	1	\$10,000	
5c	Site Preparation	lump sum	\$25,000	1	\$25,000	
5d	Temporary Fence	linear foot	\$3	500	\$1,500	
5e	Excavation ^c	ton	\$30	5,300	\$159,000	
5f	Imported Fill	ton	\$6	5,300	\$31,800	
5g	Backfilling & Compaction	ton	\$30	5,300	\$159,000	
5g	Equipment and Materials	lump sum	\$17,000	1	\$17,000	
	TOTAL					\$475,300
6	<u>Postexcavation Sampling</u>					
6a	Sampling					
	Personnel ^d	hour	\$90	40	\$3,600	
	Sampling Equipment and Materials	lump sum	\$1,600	1	\$1,600	
6b	Analyses (assumes 1 sample per approx. 850 square feet, 35-day turn around for lead and PCB analyses)	sample	\$210	62	\$13,000	
	TOTAL					\$18,200

TABLE B-4
PRELIMINARY CAPITAL COST ESTIMATE FOR REMEDIAL ALTERNATIVE 5
EXCAVATION/OFF-SITE INCINERATION
IMF SITE
NAS ALAMEDA
(Continued)

Item No.	Item/Description	Unit	Unit Cost	Quantity	Subtotal ^h	Total
7	<u>Off-Site Incineration</u>					
7a	Waste Profile Fee	lump sum	\$550	1	\$550	
7b	Transportation (assumes 20-cu.-yd. end dump, round trip)	truck load	\$2,000	185	\$370,000	
7c	Incineration ^e	ton	\$1,320	5,300	\$6,996,000	
7d	Incineration State Tax	ton	\$28	5,300	\$148,400	
	TOTAL					\$7,515,000
8	<u>Well Replacement</u>	each	\$1,000	3	\$3,000	
	TOTAL					\$3,000
9	<u>Closure Report</u> ^f	lump sum	\$9,800	1	\$9,800	
	TOTAL					\$9,800
	SUBTOTAL					\$8,043,400
	Contingency (20%)					\$1,608,700
	Project Administration (10% of Subtotal and Contingency)					\$965,200
	TOTAL CAPITAL COST ^g					\$11,000,000

Assumptions:

- ^a Site Implementation Work Plan.
- ^b Two-person crew (one professional and one technician), 33 field days, 11-hour days.
- ^c Area to be excavated is approximately 50,000 sq. feet and 2 feet deep; 105 pounds per cubic foot soil, or 1.42 tons per cubic yard.
- ^d Two-person crew (one professional and one technician), 4 total field days for collecting screening level and final confirmation samples.
- ^e Incineration at Aptus Facility in Utah.
- ^f 25-page report.
- ^g Total capital cost is rounded to the nearest one hundred thousand dollars.
- ^h Individual costs are rounded to the nearest one hundred dollars.

TABLE B-5

**PRELIMINARY CAPITAL COST ESTIMATE FOR REMEDIAL ALTERNATIVE 6A
EXCAVATION/CLASS I DISPOSAL WITH PRETREATMENT
SITE 15
NAS ALAMEDA**

Item No.	Item/Description	Unit	Unit Cost	Quantity	Subtotal ⁱ	Total
<u>REMOVAL DESIGN ACTIVITIES</u>						
1	Plan and Specification Preparation ^a	lump sum	\$15,600	1	\$15,600	
2	Treatment System Vendor Bid Preparation and Evaluation	lump sum	NA			
3	Permitting	lump sum	\$5,000	1	\$5,000	
	TOTAL					\$20,600
<u>REMOVAL DESIGN ACTIVITIES</u>						
4	<u>Well Destruction</u>	each	\$500	3	\$1,500	
	TOTAL					\$1,500
5	<u>Soil Excavation</u>					
5a	Engineering Oversight ^b	hour	\$90	760	\$68,400	
5b	Mobilization & Demobilization	lump sum	\$10,000	1	\$10,000	
5c	Site Preparation	lump sum	\$25,000	1	\$25,000	
5d	Temporary Fence	linear foot	\$3	500	\$1,500	
5e	Excavation ^c	ton	\$30	5,300	\$159,000	
5g	Imported Fill	ton	\$6	5,300	\$31,800	
5h	Backfilling & Compaction	ton	\$30	5,300	\$159,000	
5i	Equipment and Materials	lump sum	\$17,000	1	\$17,000	
	TOTAL					\$471,700
6	<u>Postexcavation Sampling</u>					
6a	Sampling					
	Personnel ^d	hour	\$90	40	\$3,600	
	Sampling Equipment and Materials	lump sum	\$1,600	1	\$1,600	
6b	Analyses (assumes 1 sample per approx. 850 square feet, 35-day turn around for lead and PCB analyses)	sample	\$210	62	\$13,000	
	TOTAL					\$18,200

TABLE B-5

**PRELIMINARY CAPITAL COST ESTIMATE FOR REMEDIAL ALTERNATIVE 6A
EXCAVATION/CLASS I DISPOSAL WITH PRETREATMENT
SITE 15
NAS ALAMEDA
(Continued)**

Item No.	Item/Description	Unit	Unit Cost	Quantity	Subtotal ⁱ	Total
7	<u>Class I Facility Disposal</u> ^e					
7a	Waste Profile Sampling	hour	\$60	8	\$480	
7b	Predisposal Lab Analytical Testing/ Waste Profile	lump sum	\$300	1	\$300	
7c	Disposal ^f	ton	\$210	5,300	\$1,113,000	
	TOTAL					\$1,113,800
8	<u>Well Replacement</u>	each	\$1,000	3	\$3,000	
	TOTAL					\$3,000
9	<u>Closure Report</u> ^g	lump sum	\$9,800	1	\$9,800	
	TOTAL					\$9,800
	SUBTOTAL					\$1,638,600
	Contingency (20%)					\$327,700
	Project Administration (10% of Subtotal and Contingency)					\$196,600
	TOTAL CAPITAL COST ^h					\$2,200,000

Assumptions:^a Site Implementation Work Plan.^b Two-person crew (one professional and one technician), 33 field days, 11-hour days.^c Area to be excavated is approximately 50,000 sq. feet and 2 feet deep; 105 pounds per cubic foot soil, or 1.42 tons per cubic yard.^d Two-person crew (one professional and one technician), 4 total field days for collecting screening level and final confirmation samples.^e Disposal at Chemical Waste Management's Kettleman Hills Class I Disposal Facility.^f Cost includes transportation, treatment (stabilization), and 10% county tax.^g 25-page report.^h Total capital cost is rounded to the nearest one hundred thousand dollars.ⁱ Individual costs are rounded to the nearest one hundred dollars.

TABLE B-6

**PRELIMINARY CAPITAL COST ESTIMATE FOR REMEDIAL ALTERNATIVE 6B
EXCAVATION/CLASS I DISPOSAL WITHOUT PRETREATMENT
SITE 15
NAS ALAMEDA**

Item No.	Item/Description	Unit	Unit Cost	Quantity	Subtotal ⁱ	Total
<u>REMOVAL DESIGN ACTIVITIES</u>						
1	Plan and Specification Preparation ^a	lump sum	\$15,600	1	\$15,600	
2	Treatment System Vendor Bid Preparation and Evaluation	lump sum	NA			
3	Permitting	lump sum	\$5,000	1	\$5,000	
	TOTAL					\$20,600
<u>REMOVAL DESIGN ACTIVITIES</u>						
4	<u>Well Destruction</u>	each	\$500	3	\$1,500	
	TOTAL					\$1,500
5	<u>Soil Excavation</u>					
5a	Engineering Oversight ^b	hour	\$90	760	\$68,400	
5b	Mobilization & Demobilization	lump sum	\$10,000	1	\$10,000	
5c	Site Preparation	lump sum	\$25,000	1	\$25,000	
5d	Temporary Fence	linear foot	\$3	500	\$1,500	
5e	Excavation ^c	ton	\$30	5,300	\$159,000	
5g	Imported Fill	ton	\$6	5,300	\$31,800	
5h	Backfilling & Compaction	ton	\$30	5,300	\$159,000	
5i	Equipment and Materials	lump sum	\$17,000	1	\$17,000	
	TOTAL					\$471,700
6	<u>Postexcavation Sampling</u>					
6a	Sampling					
	Personnel ^d	hour	\$90	40	\$3,600	
	Sampling Equipment and Materials	lump sum	\$1,600	1	\$1,600	
6b	Analyses (assumes 1 sample per approx. 850 square feet, 35-day turn around for lead and PCB analyses)	sample	\$210	62	\$13,000	
	TOTAL					\$18,200

TABLE B-6

**PRELIMINARY CAPITAL COST ESTIMATE FOR REMEDIAL ALTERNATIVE 6B
EXCAVATION/CLASS I DISPOSAL WITHOUT PRETREATMENT
SITE 15
NAS ALAMEDA
(Continued)**

Item No.	Item/Description	Unit	Unit Cost	Quantity	Subtotal ⁱ	Total
7	<u>Class I Facility Disposal</u> ^e					
7a	Waste Profile Sampling	hour	\$60	8	\$480	
7b	Predisposal Lab Analytical Testing/ Waste Profile	lump sum	\$300	1	\$300	
7c	Disposal ^f	ton	\$100	5,300	\$530,000	
	TOTAL					\$530,800
8	<u>Well Replacement</u>	each	\$1,000	3	\$3,000	
	TOTAL					\$3,000
9	<u>Closure Report</u> ^g	lump sum	\$9,800	1	\$9,800	
	TOTAL					\$9,800
	SUBTOTAL					\$1,055,600
	Contingency (20%)					\$211,100
	Project Administration (10% of Subtotal and Contingency)					\$126,700
	TOTAL CAPITAL COST ^h					\$1,400,000

Assumptions:^a Site Implementation Work Plan.^b Two-person crew (one professional and one technician), 33 field days, 11-hour days.^c Area to be excavated is approximately 50,000 sq. feet and 2 feet deep; 105 pounds per cubic foot soil, or 1.42 tons per cubic yard.^d Two-person crew (one professional and one technician), 4 total field days for collecting screening level and final confirmation samples.^e Disposal at Chemical Waste Management's Kettleman Hills Class I Disposal Facility.^f Cost includes transportation, treatment (stabilization), and 10% county tax.^g 25-page report.^h Total capital cost is rounded to the nearest one hundred thousand dollars.ⁱ Individual costs are rounded to the nearest one hundred dollars.

ATTACHMENT B

**RESPONSE TO COMMENTS ON THE SITE 15
REMOVAL ACTION ENGINEERING EVALUATION/COST ANALYSIS REPORT**

Chronology of Public Involvement

The Navy announced the Site 15 removal action plans to the public at a restorations advisory board (RAB) meeting on January 12, 1994. The original remedy proposed for the removal was excavation and landfilling of contaminated soil. Based on comment provided during the January 12 RAB meeting, the Navy revised the remedy to include an innovative technology that offered a permanent solution to the cleanup of Site 15. The Navy prepared an engineering evaluation/cost analysis (EE/CA) for public review.

The draft EE/CA for the Site 15 removal action was issued for 30-day public review on April 19, 1994. At the May 3, 1994 RAB meeting, the Navy presented the recommended remedy to the public. The remedy included solvent extraction of soil for PCB removal, and acid washing for lead removal.

At the June 7, 1994 RAB meeting, the Navy announced that the public comment period was closed, and that the action memorandum documenting the decision would be issued to the information repository. The DTSC announced that a California Environmental Quality Act (CEQA) determination was being conducted, and that public notice of availability would be published. The public would be given a 30-day review period.

At the August 2, 1994 RAB meeting, the Navy announced that the action memorandum (documenting the final decision on the remedy for Site 15) would be placed in the information repository, and that a notice of availability would be published. The Navy also announced that the remedial action contractor was soliciting vendors for the implementation of the technology. The final EE/CA was published on August 22, 1994. The final EE/CA incorporated public and agency comments. The responsiveness summary that follows documents the public and agency comments as they were received, and the responses.

At the September 13, 1994 RAB meeting, the Navy announced that the Site 15 remedy had been revised to include a new, more efficient and cost effective soil washing technology. Because the technology had been demonstrated as effective for petroleum hydrocarbons, but had not yet been demonstrated as effective for PCB and lead removal, the Navy would ask U.S. EPA's Superfund Innovative Technology Evaluation (SITE) program to oversee and evaluate the initial stages of implementation.

At the November 1, 1994 RAB meeting, a Site 15 removal action fact sheet was distributed to the meeting attendees.

ATTACHMENT B

RESPONSE TO COMMENTS ON THE SITE 15 REMOVAL ACTION ENGINEERING EVALUATION/COST ANALYSIS REPORT

This section presents the Navy's responses to comments received by the DTSC, State of California Regional Water Quality Control Board - San Francisco Bay Region (RWQCB), Community Advisory Committee (CAC), and Sierra Club. The DTSC, CAC, and Sierra Club comments were transmitted to WESTDIV through letters dated May 19, 1994. DTSC's comments summarize critical points of the RWQCB comments sent to DTSC in a letter dated May 12, 1994. The PRC team received DTSC and RWQCB comments on May 19, 1994, CAC comments on May 20, 1994, and Sierra Club comments on May 23, 1994 from WESTDIV. Comments are presented verbatim in bold typeface. The Navy's responses are in normal typeface.

DTSC

Specific Comments

Comment No. 1: Section 1.0 - Introduction

The introduction should state clearly the reasons why a removal action is being conducted at this site.

Response:

This section will be revised to include the following statements:

The Navy has determined that a removal action is appropriate at Site 15 based on the following factors established in the Code of Federal Regulations Title 40 Part 300.415 (40 CFR 300.415).

- (i) Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances, pollutants, or contaminants.
- (iv) High levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface that may migrate.
- (v) Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released.

The removal action will focus on reducing the existing risk to human health and the environment by removing surface soils with elevated PCB and lead concentrations.

Comment No. 2:

Section 2.2 - Current Use (page 2-2)

Please add that the area is fenced and has signs warning that this is a hazardous and contaminated area. The exact language of the signs should be included.

Response:

This section will be revised to include the following statement:

Site 15 is enclosed by an approximately 8-foot high, chain-link fence and signs stating "Warning - PCB Contamination in Surface Soil, Unauthorized Personnel Prohibited" are posted.

Comment No. 3:

Section 2.5 - Nature, Source, and Extent of Contamination page 2-5, first paragraph)

Please add paint to the list of substances that have had lead as an additive. The Report states that the source of elevated lead at Site 15 is unknown; this is true. However, a potential source of the lead may be the lead paint applied to buildings at the site. The distribution of lead contamination correlates to the footprints of the buildings at Site 15.

Response:

This paragraph will be revised to include the following statements at the end of the paragraph:

However, a potential source of the lead may be the lead paint applied to buildings at the site. The distribution of elevated lead concentrations correlates with the footprints of the buildings at Site 15.

Comment No. 4:

Section 2.6 - Potential or Actual Impacts on Surrounding Populations (page 2-6)

Please state the depth to groundwater at Site 15.

Response:

As stated in Section 2.3.2.1 - Site Geology and Hydrogeology, the depth to groundwater at Site 15 ranges from 2.5 to 5.2 feet below ground surface (bgs); the average depth to groundwater is 3.7 feet bgs. This information will be referenced and restated in Section 2.6 - Potential or Actual Impacts on Surrounding Populations.

Comment No. 5:

Section 2.7 - Justification of Removal Action

The justifications listed for carrying out a Removal Action at Site 15 should be more site specific. For example: shallow groundwater at the site; workers in the area; surface transport of PCB-contaminated soil off the site; proximity of the Oakland Inner Harbor.

Response:

This section will be revised to include the following statement:

A removal action is justified because (1) PCBs have been released; (2) elevated levels of PCBs and lead were detected in surface soils; (3) base personnel work in the area; (4) site groundwater is shallow; (5) surface transport of soil could carry PCBs and lead off site; and (6) Site 15 is near the Oakland Inner Harbor.

Comment No. 6:

Section 2.8 - Removal Action Objectives (page 2-8)

Please further define unacceptable human health risk at the proposed PCB soil cleanup level of 1 mg/kg.

Response:

As stated in the U.S. Environmental Protection Agency's (EPA) "Guidance on Remedial Actions for Superfund Sites with PCB Contamination," EPA/540/G-90/007, August 1990, pp. 26-28:

The 1 mg/kg cleanup level is a preliminary remediation goal for sites where unlimited exposure under residential land use is assumed. The 1 mg/kg level reflects a protective, quantifiable concentration for soil. Lower concentrations are not generally quantifiable and in many cases will be below background concentrations. A concentration of 1 mg/kg is generally the starting point for analysis at PCB-contaminated Superfund sites where land use is residential.

As stated in the EE/CA report, the proposed PCB soil cleanup level of 1 mg/kg is an interim cleanup goal for purposes of this removal action. The final PCB cleanup goal will be established based on the human health and ecological risk assessment to be conducted during the remedial investigation/feasibility study.

Comment No. 7:

Section 2.8 - Removal Action Objectives (page 2-8)

Please explain how the proposed cleanup goal of 130 mg/kg for lead was calculated using the Cal/EPA, Department of Toxic Substances Control Preliminary Assessment Guidance Manual (PEA Manual). The final PEA Manual was published January 1994.

Response:

The final DTSC PEA Manual published in January 1994 states in Section 2.5.1.3 - Chemical Groups, Inorganic Lead (page 2-19) that:

For screening purposes, the Office of Scientific Affairs (OSA) has established that a concentration of inorganic lead concentrations less than 130 ppm in soil constitutes an acceptable health risk. This value was obtained using the spreadsheet model LEADSPREAD, which is described in

guidance from OSA (DTSC, 1992, Chapter 7) and conservative, screening level assumptions.

Comment No. 8:

Section 2.8.2 - Determination of Removal Schedule (page 2-9)

The schedule requires updating. Because this EE/CA contains three preferred alternatives the Navy must provide public notice and a 30-day comment period for the chosen alternative. A public notification and 30-day public comment period of the Action Memorandum will satisfy the requirements of the selected alternative.

Also, a CEQA determination is necessary for this project. A Negative Declaration may be in order. If this is the case the public comment period for the Negative Declaration may correspond with the comment period of the Action Memorandum.

The schedule must include time for the Navy to respond to comments and make any necessary changes to the Implementation Work Plan.

Response:

Section 2.8.2 - Determination of Removal Schedule will be updated. The Navy will prepare a public notification and provide a 30-day public comment period of the action memorandum and the chosen removal action alternative.

The Navy agrees that a California Environmental Quality Act (CEQA) determination and negative declaration may be necessary for this project. The Cal-EPA DTSC will prepare the CEQA and negative declaration based as a result of the progress review meeting held on May 25, 1994. The CEQA and negative declaration will be made available for public review and comment in conjunction with the action memorandum public comment period (see above).

The updated schedule will include time for the Navy to respond to comments and make any necessary changes to the implementation work plan.

Comment No. 9:

Section 3.2.2 - Removal and Disposal Actions (page 3-4)

Material with PCB values which exceed the Soluble Threshold Limit Concentration (STLC) of 5.0 mg/l or the Total Threshold Limit Concentration (TTLC) of 50 mg/l is considered a hazardous waste in accordance to California Code of Regulations, Title 22, Section 66261.24 (a) (2) (B).

Response:

Sections 2.5 and 3.2.2 will be revised to include the above comment.

Comment No. 10:

Section 4.2.2.4 - Alternative 4: Excavation, On-Site Solvent Extraction and Stabilization or Acid Washing, and On-Site Disposal

(page 4-12), On-Site Solvent Extraction and Stabilization or Acid Washing (page 4-14), and Appendix B (Table B-3)

On page 4-12 the EE/CA states that residual solvents, acids, and untreated wastes would generally contain highly concentrated contaminants that require disposal at an off-site incineration facility. Are the costs associated for incineration included in the estimated capital costs for implementing Alternative 4? Table B-3 does not include incineration as an item. Incineration is included in the costs estimates for Alternative 2 Excavation/ On-Site Soil Washing/On-Site Disposal. Including incineration in the costs could increase the cost of Alternative 4 by \$836,000.

Response:

Section 4.2.2.4 - Alternative 4: Excavation, On-Site Solvent Extraction and Stabilization or Acid Washing, and On-site Disposal and Appendix B (Table B-3) will be revised to include costs associated with incineration of residual solvents, acids, and untreated wastes containing highly concentrated contaminants as a result of the acid washing process. Incineration costs are currently not included in the estimated costs for implementing Alternative 4.

Comment No. 11:

Section 4.3 - Comparative Analysis of Interim Remedial Action Alternatives (page 4-19)

The EE/CA identifies Alternative 4 as one of the preferred alternatives. However, Alternative 4 is actually two alternatives. One with stabilization and the other with acid washing. These sub-alternatives would require the on-site disposal of stabilized lead. Stabilization is part of Alternative 3 and is discussed on page 4-10. There the EE/CA states, "However, backfilling the treated soil into the excavation reduces but does not eliminate the potential for any future releases to groundwater" and "Implementation of this alternative may only provide moderate degree of protection to both human health and the environment on a long-term basis."

The EE/CA should make a distinction between these two sub-alternatives in this concluding section.

Response:

This concluding section will be revised to differentiate and evaluate Alternative 4A (soil excavation, on-site treatment using solvent extraction and stabilization, and disposal on site) and Alternative 4B (soil excavation, on-site treatment using solvent extraction and acid washing, and disposal on site). Alternative 4A is eliminated because on-site disposal of stabilized lead does not provide adequate protection to both human health and the environment on a long-term basis.

Comment No. 12:

Section 4.3 - Comparative Analysis of Interim Remedial Action Alternatives (page 4-19)

The EE/CA should provide one single recommendation for the removal action.

Response:

The concluding section of the EE/CA report will be revised to state that Alternative 4B (soil excavation, on-site treatment using solvent extraction and acid washing, and disposal on site) is the preferred alternative for the protection to both human health and the environment on a long-term basis. Alternative 6 (soil excavation and disposal at a Class I facility with or without treatment) is also eliminated because the EPA prefers treatment over land disposal approaches ("Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA," U.S. EPA, August 1993) and states under CERCLA Section 121 Cleanup Standards that:

the off-site transport and disposal of hazardous substances or contaminated materials without treatment should be the least favored alternative remedial action where practicable treatment technologies are available.

RWQCB

General Comments

Comment No. 1:

A leachability study, preferably a column test, should be performed on the soils left in place after this removal action to assess the potential for soils with lead concentrations under 130 parts per million (ppm) to leach into the groundwater. The water used in this leachability study should have the pH of rain water. Leachability studies should be run on ten confirmatory soil samples. The RWQCB agrees with the report that the lead contamination at Site 15 is restricted to the shallow surface soils, and currently not present in the subsurface or the groundwater. However, the Navy shall still assess the potential risk that any remaining soil may pose to the groundwater at Site 15. The groundwater is about 4 feet below ground surface, and Site 15 is located only 300 feet from the Oakland Estuary. Therefore, contamination leaching into the shallow groundwater could adversely affect San Francisco Bay.

Response:

The Navy agrees that a leachability study should be performed on soils left in place after completion of this removal action to assess the potential for soils with lead concentrations under 130 ppm to leach into the groundwater. The Navy proposes to analyze ten percent of the total number of confirmatory soil samples collected for soluble lead using a modified waste extraction test (WET). The modification will require performing the leachability study using distilled water in place of sodium citrate in order to determine the leachability of residual soil at the site. The state of California STLC for soluble lead is 5.0 mg/L.

Comment No. 2:

The dates shown on the removal schedule showing when the Navy will submit the Final Action Memorandum and Final Implementation Work Plan shall be at least 60 days after the draft of these two respective reports are submitted. There is only a 30 day spacing between deliverance of Draft and Final documents. Sixty days is needed to give the public and the agencies at least 30 days to comment on the Action Memorandum and the Implementation Work Plan, and some time for the Navy and the regulators to resolve the comments on the respective reports.

Response:

This comment is addressed above in the Navy's response to DTSC's Comment No. 8..

Comment No. 3:

Please state in the conclusions of this Site 15 EE/CA report that Remedial Action Alternative 4 (soil excavation, on-site treatment using solvent extraction and stabilization or acid washing, and disposal on site) is preferred to Alternative 6 (soil excavation and disposal at a Class I facility with or without treatment). The reason is that Alternative 6 is disposing the soil in a landfill, while Alternative 4 is disposing the soil on site. From a water quality standpoint, and from a landfill management standpoint, disposal at a Class I facility is not the preferred option. In addition, one of EPA's items on its checklist for evaluating the effectiveness of a remedial alternative is Alternatives to land disposal. (Review of Revised Draft of Non-Time-Critical Removal Action Guidance, U.S. Environmental Protection Agency, October 22, 1992, page 49.)

Response:

This comment is addressed above in the Navy's response to DTSC Comment No. 12.

Specific Comments

Comment No. 1:

Section 2.6 - Potential or Actual Impacts on Surrounding Populations

Ecological receptors should be mentioned in this summary. The second paragraph states that "PCBs and lead could affect the Oakland Inner Harbor given that the groundwater level is shallow and PCBs and lead may affect the groundwater." It follows that this section should mention the ecological receptors that inhabit the Oakland Inner Harbor.

Response:

Section 2.6 will be revised to state that PCBs and lead could affect the Oakland Inner Harbor through site groundwater or surface water migration. At present, no work has been performed in the vicinity of Site 15 to identify potential ecological receptors that inhabit the Oakland Inner Harbor. However, an ecological assessment has been proposed under the remedial investigation/feasibility study for NAS Alameda.

Comment No. 2:

Section 2.8 - Removal Action Objectives (page 2-7 and 2-8)

Please add in this introductory section that confirmatory column test will be run for the remaining soil. See General Comment No. 1. This is necessary as the report says on the bottom of page 2-7, that one of the objectives of this interim removal action is to reduce the potential impacts of soil contaminants on the groundwater.

Response:

This comment is addressed above in the Navy's response to RWQCB General Comment No. 1.

Comment No. 3:

Section 2.8 - Removal Action Objectives (page 2-8)

Please clarify whether the default cleanup goal of 130 ppm used by the Department of Toxic Substances Control (DTSC) will require further human health or ecological risk evaluation.

Response:

The default cleanup goal of 130 ppm for lead is the cleanup goal for the removal action at Site 15. The final cleanup goals at this site will be established based on the human health and ecological risk assessment to be conducted during the remedial investigation/feasibility study. The risk evaluation will be developed based on the residual concentrations remaining at Site 15 after completion of the removal action.

Comment No. 4:

Section 2.8.2 - Determination of Removal Schedule

The Navy shall submit the Final Action Memorandum no less than 60 days after they submit the Draft Action Memorandum, which the agencies and public will review. Please see General Comment No. 2.

Response:

This comment is addressed above in the Navy's response to DTSC Comment No. 8.

Comment No. 5:

Section 2.8.2 - Determination of Removal Schedule

The Navy shall submit the Final Implementation Work Plan no less than 60 days after they submit the Draft Implementation Work Plan, which the agencies and public will review. Please see General Comment No. 2.

Response:

This comment is addressed above in the Navy's response to DTSC Comment No. 8.

Comment No. 6:

Figure 2-1 - Site Map for Site 15

Please draw the location of the elevated berm that exists between Site 15 and the Oakland Inner Harbor, on this site map.

Response: Figure 2-1 will be revised to show the location of the elevated berm between Site 15 and the Oakland Inner Harbor.

Comment No. 7: Figure 2-3 - Surface Sample Locations and Results, Total Lead, Site 15

The concentrations of lead observed in the groundwater at wells M-15-01, M-15-02, and M-15-03 shall be identified on this map. The values are in the very low parts per billion, and are fundamental to the argument that the lead contamination at Site 15 is restricted to the shallow, vadose zone soils.

Response: Figure 2-3 will be revised to show the concentrations of lead detected in the groundwater at wells M-15-01 (<2.0 micrograms per liter [$\mu\text{g/L}$]), M-15-02 (<6.0 $\mu\text{g/L}$), and M-15-03 (<2.0 $\mu\text{g/L}$).

Comment No. 8: Section 4.2.1.1 - Effectiveness

Alternatives to land disposal should be an item under the objectives of evaluating the effectiveness of a remedial alternative. See General Comment No. 3.

Response: The effectiveness of a removal action alternative refers to its ability to meet the removal action objectives. These objectives will be revised in this section to include the U.S. EPA's preference of treatment over land disposal alternatives where practicable treatment technologies are available.

Comment No. 9: Section 4.2.2.5 - Alternative 5: Excavation and Off-Site Incineration, Cost Summary

Please provide some basis for the cost estimate of \$11 million for this remedial alternative. The Navy should estimate how much they would have to pay the incinerator per ton of waste.

Response: The detailed cost estimate and basis of the \$11 million for implementing Alternative 5 is provided in Appendix B (Table B-4). The incineration cost is \$1,320 per ton of waste.

Comment No. 10: Section 4.3 - Comparative Analysis of Interim Remedial Action Alternatives (page 19)

In the last paragraph, please state that Alternative 4 is the preferred option as it is an alternative to disposing of the soil in a landfill. See General Comment No. 3.

Response: This comment is addressed above in the Navy's response to DTSC Comment No. 12.

CAC

General Comments

Comment No. 1:

At the grass-roots level, I (Roberta Hough) have heard consistent and unequivocal opposition to excavation, transport and off-site disposal of contaminated soil. This is particularly true when incineration or landfilling without significant treatment for volume and toxicity reduction are the final disposition. Residents do not want hazardous waste transported through our community. There is probably equal concern regarding contributing to environmental racism, e.g. that the final disposal site adversely affects that neighboring community which has similar concerns about health and safety as any community but is politically under-represented or otherwise excluded from having the same choices as more affluent areas. This is specifically true at the IT operated Kasmalia dump in Kern county. Therefore, I suggest that Alternative 6 does not meet the community acceptance criterion of CERCLA.

Response:

The Navy agrees. Please see above the Navy's response to DTSC Comment No. 12.

Comment No. 2:

The Restoration Advisory Board for NAS Alameda convened just 30 days ago. We have not established a community co-chair nor procedures for agendaizing items for discussion. Alternative 6 was not emphasized during the brief presentation at the May 3 meeting. I (Roberta Hough) suggest that the preferred Alternative 4B could be implemented with community acceptance. However, should Alternative 4B not be selected, I (Roberta Hough) believe that further discussion is justified. The future landfill bans, current extensions notwithstanding, indicates general acknowledgment of the unsustainability of such an approach; they are not permanent solutions at the final destination. Also, other alternatives which would have community acceptance were dismissed without further evaluation ostensibly because they require a two-stage approach. The weight given to a lack of institutional history should be considered in light of economic conversion and the obvious interest in improving the CERCLA performance as seen in the current reauthorization discussions.

Response:

The Navy preferred removal action alternative is Alternative 4B (soil excavation, on-site treatment using solvent extraction and acid washing, and disposal on site). Please see above the Navy's response to DTSC Comment No. 12.

Comment No. 3:

In addition, the copy of this report made available through the information repository at the Alameda Main Branch Library did not include the request for comment letter with the report. This severely

restricts the ability of the general public to even be aware of their ability to comment on this action, much less make their opposition to the off-site disposal known.

Response: For future documents made available to the public for comment, the Navy will provide, with the document, a letter inviting the public to review and comment on the document, and stating the comment period duration.

Specific Comments

Comment No. 1: Some bias is suggested in the report including overstating the Alternative 4B cost by \$200,000 in the text, page 4-14.

Response: The true estimated cost for implementing each removal action alternative is presented in Appendix B. However, these costs were inadvertently not revised in the text, resulting in a discrepancy between costs in the text and in Appendix B. This oversight will be corrected in the final EE/CA report.

Comment No. 2: Some bias is suggested in the report including concluding that "Overall, this alternative may be difficult to implement" when no rationale for this statement has been given for Alternative 4B (acid washing) only for 4A (stabilization), page 4-14; (It is not credible that space for the treatment facility is a significant obstacle at the 1526 acre base).

Response: This section will be revised to state that Alternative 4A may be difficult to implement given the rationale provided for Alternative 4A, whereas Alternative 4B is implementable given the rationale provided for Alternative 4B.

Comment No. 3: Some bias is suggested in the report including presenting a schedule which appears untenable when treatability studies are desirable to lower cost, page 2-9.

Response: The schedule provided in the EE/CA report will be updated to include time for performing and evaluating the results of treatability studies as part of the removal action implementation.

Comment No. 4: Some bias is suggested in the report including the without pretreatment option when the text suggests that the one Class I facility contacted would require pretreatment, page 4-17. It is unclear what incentive the landfill operator might have for not pretreating the soil.

Response: The Class I landfill facility requires conducting a waste profile for incoming waste streams. Given the results of the profile and land disposal regulations, pretreatment for particular compounds may or may not be

required prior to disposal. The Class I facility indicated that based on the available Site 15 analytical data, it will accept the soil for disposal with pretreatment for elevated concentrations of lead only. Facility personnel indicated that the pretreatment process for lead would also effectively treat PCBs. It is assumed that on completion of the pretreatment process for lead, no further post-treatment is required for land disposal.

Sierra Club

Comment No. 1:

The proposed cleanup standards are reasonably protective for an interim action at this small, isolated, and little-used site. These levels may, however, be unsuitable for a final remedial action. Should the recent and surprising discovery of elevated levels of PCBs in fish collected in the North Bay turn out to be caused by PCB-contaminated soil blowing into the Bay, the 1 mg/kg cleanup level for soil may need to be lowered for a final action. We are also concerned that recent epidemiological studies in urban areas with lead tainted soils suggest that lead levels much lower than 130 mg/kg are required to protect the health of children. A recreation area accessible to children is one possible future use for this site.

Response:

As stated in the EE/CA report in Section 2.8 - Removal Action Objectives, the removal action objectives at Site 15 are to mitigate the risk to human health and the environment from the potential exposure to soils with elevated PCB and lead levels, and to reduce the potential impacts of soil contaminants on the groundwater. To address these objectives, the Navy proposes interim cleanup goals of 1.0 mg/kg for PCBs and 130 mg/kg for lead. The proposed cleanup goal of 1 mg/kg for PCBs is considered by the U.S. EPA as that level which would not pose an unacceptable human health risk under a residential scenario considering ingestion, inhalation, and dermal contact exposure pathways. The proposed cleanup goal of 130 mg/kg for lead is the default value used by DTSC and constitutes an acceptable human health risk that requires no further risk evaluation. These proposed cleanup goals are not the final cleanup levels for Site 15. The final cleanup goals at this site will be established based on the human health and ecological risk assessment to be conducted during the remedial investigation/ feasibility study. The risk evaluation will be developed based on the residual concentrations remaining at Site 15 after completion of the removal action.

Comment No. 2:

Cost - How Much for an Isolated Site?

As the design for the removal action is refined, the cost of the proposed alternative may increase beyond the estimate in the Engineering Evaluation and Cost Analysis Report (EECAR) to a level that is unreasonable for an interim action at an isolated site. The EECAR notes that the normal budget limit for interim actions conforming to guidelines in the Comprehensive Environmental

Cleanup and Liability Act (CERCLA) is 2 million dollars. Pre-design estimates in the EECAR place the cost of this alternative well over this limit, at almost 2.5 million dollars. The estimated cost of this single action for a site that is unlikely to be a significant part of any short term reuse plan amounts to almost 10% of the entire environmental budget in the Base Cleanup Plan (BCP) for fiscal years 94 and 95 combined. If the cost of implementing this alternative rises substantially, other alternatives should be reconsidered. Cost estimates for this alternative involving solvent extraction and acid washing should be significantly more reliable after results of laboratory treatment studies become available.

Initial cost estimates for new processes are frequently too low and the proposed action includes two new processes, solvent extraction and soil washing. The EECAR cost estimate also omitted the cost of required treatability studies and of off-site disposal of treatment residuals. With two new processes, the cost of treatability studies could be significant, over \$100,000. The treatability studies may also show that the treatment process may generate a significant volume of residuals that will have to be disposed of off-site, at significant additional cost.

Alternative funding may be available to help defray the cost of demonstrating this innovative treatment and on-site reuse of soil, but application procedures for these funds would probably delay implementation. The U.S. EPA SITE program, a technology demonstration program, is one example of an alternative funding source.

Should costs of the solvent extraction and soil washing alternative escalate, I believe that capping of the site should be considered in addition to the interim removal action alternatives described in the EECAR. A temporary cap, such as asphalt for a parking lot, would stop the wind-borne spread of PCB contaminated soil and further slow leaching of PCBs and lead from the soil into the groundwater beneath the site. A cap would reduce leaching by stopping the percolation of rainwater through the soil.

Capping may become the preferred interim action if costs of the selected solvent extraction and soil washing alternative escalate significantly. Selection of capping would then make substantial funding available earlier to other high priority sites. Other high priority sites include those that would be more likely to be a significant part of a short term reuse plan or that are sources of toxic compounds that are migrating off-site. Examples of such sites include soil containing heavy metals outside of metal plating shops and the landfills that are leaching toxic metals and chemicals into the San Francisco Bay.

Although it may be difficult to justify the proposed removal action at this time solely on the basis of immediate cost-effectiveness for the ANAS (Alameda Naval Air Station), this removal action is also an investment in the Navy's future. If successful, this innovative approach to on-site management of soil containing lead and PCBs promises to reduce the Navy's exposure to future liabilities at off-site disposal facilities. Reduction of future liabilities is a significant advantage in this era of the doctrine of joint and several liability. This legal doctrine make the Navy potentially responsible for all remedial expenses at any facility where it deposits Navy wastes, even if the Navy contributed only an insignificant fraction of the waste. Any reduction in the amount of waste shipped off-site reduces the Navy's exposure.

Response:

The statutory limits on removal actions specified in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) limits the dollars and time spent on removal actions to \$2 million and 12 months, respectively. The NCP provides guidance for Superfund sites; NAS Alameda is not a Superfund site. Therefore, the final EE/CA report will be revised accordingly.

The cost for performing solvent extraction and acid washing bench-scale studies is approximately \$20,000. The cost for incinerating highly contaminated residuals from the solvent extraction and acid washing processes is estimated at \$420,000. These costs will be included in the cost estimate for implementing Alternative 4B - soil excavation, on-site treatment using solvent extraction and acid washing, and disposal on site. Similarly, the costs for implementing other removal action alternatives will be revised to incorporate costs for bench-scale tests and incineration where applicable.

Capping would only provide limited protection to human health and the environment by stopping potential wind-borne spread of PCB-contaminated soil and reducing the potential for leaching of PCBs and lead from soil into the site groundwater. However, the PCB and lead contaminants would remain on site and would require remediation some time in the future. Therefore, the Navy believes that it is more cost effective to address the PCBs and lead in surface soil under this removal action to facilitate land reuse.

EPA prefers treatment over land disposal approaches (Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA, U.S. EPA, August 1993), and states under CERCLA Section 121, Cleanup Standards, that:

the off-site transport and disposal of hazardous substances or contaminated materials without treatment should be the least favored alternative remedial action where practicable treatment technologies are available.

Comment No. 3:

Provide More Background Information in EECARs and Feasibility Studies.

As emphasized in the above section on cleanup costs, costs of interim actions must be considered within the context of the cleanup plan for the entire air station. Therefore, the cost analysis should include a brief summary of the environmental cleanup budget for the entire facility and an explanation of why a particular site is being chosen for interim action before other sites.

The cost analysis should discuss the benefits of an interim action as well as its monetary cost. The analysis should address the following questions:

- 1) How will the action reduce environmental risks?
- 2) How will the action increase the value of the land?

Since this is an interim action, the discussion of these questions need not be extensively documented. In many cases a simple relative ranking with other sites that could not be considered for interim actions would suffice. There are many community and government organizations in the San Francisco Bay Area with both interest and expertise in environmental and land use planning that would help with a relative ranking. The East Bay Conversion and Reinvention Commission can supply general guidance for developing ranking criteria. The Reuse Authority for ANAS, the City of Alameda's Base Reuse Advisory Group, and your own Restoration Advisory Board can assist with actual ranking of the sites.

The inclusion in the EECAR of several readily available pieces of information and graphical aids would assist with the coordination of the remedial action and reuse plans. These include 1) a comparison of the cost per acre or square foot of cleaning up the property with the prevailing value of industrial, commercial, and residential real estate in the area; and 2) the inclusion of graphical schedules for implementation of both the interim action and the land use plan. Concerns about tentative schedules raising false expectations among local community could be addressed by carefully explaining the assumptions upon which the schedules are based. Careful explanation of these assumptions would be invaluable for protecting the Navy's credibility whether or not graphical schedules are included.

Response:

The Navy will consider whether a relative ranking system is necessary. The purpose of an EE/CA report is to evaluate treatment and disposal alternatives in order to perform a removal action. The interim cleanup goals for this removal action are based on a residential scenario, thus increasing land reuse value. Any information pertaining to this project

will be given to the City of Alameda's Base Reuse Advisory Group upon request to assist in developing a base reuse plan.

A comparison of cost per acre is not included in this EE/CA report for Site 15. However, this may be performed for future EE/CA reports. The schedule presented in the EE/CA report provides a general timeframe for implementing the site removal action and will be updated in the final EE/CA report. A more accurate schedule will be provided at the beginning of the removal action field activities.

Comment No. 4:

Suggestions for Improving Community Acceptance

Besides providing interim action and land use as discussed in the previous section, the Navy can add several other items of information to EECARs and Feasibility Studies to increase community acceptance of remedial actions, such as that proposed for Site 15. Each planning document, either an attached cover letter or preferably in the document itself, should describe how the document and its parts, such as the executive summary, will be distributed and who has been asked to serve as reviewers. A clear explanation of the document distribution will enable reviewers to assure the Navy that all interested parties have been notified about the document and will facilitate coordination between reviewers.

Another suggestion for improving community acceptance is specific to actions involving reuse of soil on site. Since the public is more concerned about soil returned to a site in their neighborhood than soil sent to a landfill, it may be worth the additional cost to sample treated soil returned to a site more frequently than that sent to a landfill. I suggest that you increase sampling frequency for this reused soil to the equivalent of 1 sample per dump truck (about 1 for every 16 cubic yards). One sample for every dump truck is more reassuring than one sample for every 6 dump trucks (about 1 for every 100 cubic yards). The extra cost could be offset by increasing to 6 the number of samples per composite actually analyzed. The \$10,000 this additional sampling would cost is a relatively inexpensive insurance policy for a 2 million dollar project. Similarly, post excavation sampling of the area outside of the excavation, as well the excavation's side walls and base, would reassure the public that all contaminated soil had been removed.

Response:

This report is an EE/CA and not a feasibility study. A copy of the Navy's cover letter including distribution list will be provided with documents made available for public review and comment.

The Navy's preferred removal action alternative (Alternative 4B - soil excavation, on-site treatment using solvent extraction and acid washing, and disposal on site) includes reuse of soil on site. The Navy proposes

increasing the sampling frequency for the reused soil to 1 sample for every 50 cubic yards based on the Bay Area Air Quality Management District's Regulation 8, Rule 40, Section 8-40-601.

The Navy proposes no post excavation sampling of the area outside of the excavation area because sufficient information exists in these areas to demonstrate that the site removal action objectives have been met.

ATTACHMENT C

**SITE 15 REMOVAL ACTION
ENGINEERING EVALUATION/COST ANALYSIS
APPROVAL MEMORANDUM**

CLEAN

Contract No. N62474-88-D-5086

Contract Task Order No. 0258

**Navy BRAC Environmental Coordinator: Lieutenant Michael Petouhoff
U.S. EPA Regional Project Manager: James Ricks, Jr.
California EPA Project Manager: Tom Lanphar
Navy Remedial Project Managers: Gary Munekawa and George Kikugawa
PRC Installation Coordinator: Duane Balch
Montgomery Watson Remedial Project Manager: Kenneth Leung**

**SITE 15 REMOVAL ACTION
ENGINEERING EVALUATION/COST ANALYSIS
APPROVAL MEMORANDUM**

**NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA**

FINAL

Prepared by:

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August 22, 1994

APPROVAL FOR ENGINEERING EVALUATION/COST ANALYSIS

As detailed in Section II of this memorandum, conditions at Site 15 at the Naval Air Station in Alameda, California, meet the National Oil and Hazardous Substances Pollution Contingency Plan criteria for removal actions. Based on site evaluations, current and potential threats to public health, welfare, or the environment exist at Site 15. An engineering evaluation/cost analysis of remedial alternatives identifies the most appropriate and cost effective method of conducting a removal action. The Navy approves the performance of an engineering evaluation/cost analysis at Site 15. Documentation of Navy approval is indicated by the signatures shown below.

Commanding Officer:

Captain F.J. Dodge, USN
Naval Air Station, Alameda

Date: _____

Navy On-Scene
Coordinator:

Lieutenant Mike Petouhoff, BRAC Environmental Coordinator

Remedial Project
Manager:

George Kikugawa, Environmental Engineer-In-Charge
Western Division, Naval Facilities Engineering Command

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I. PURPOSE

This approval memorandum documents the Navy's decision to conduct an engineering evaluation/cost analysis (EE/CA) for a removal action at Site 15 at Naval Air Station (NAS) Alameda, California.

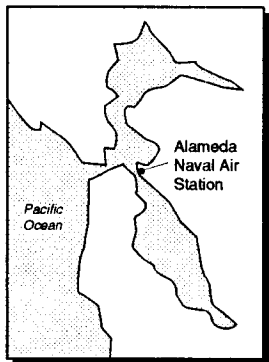
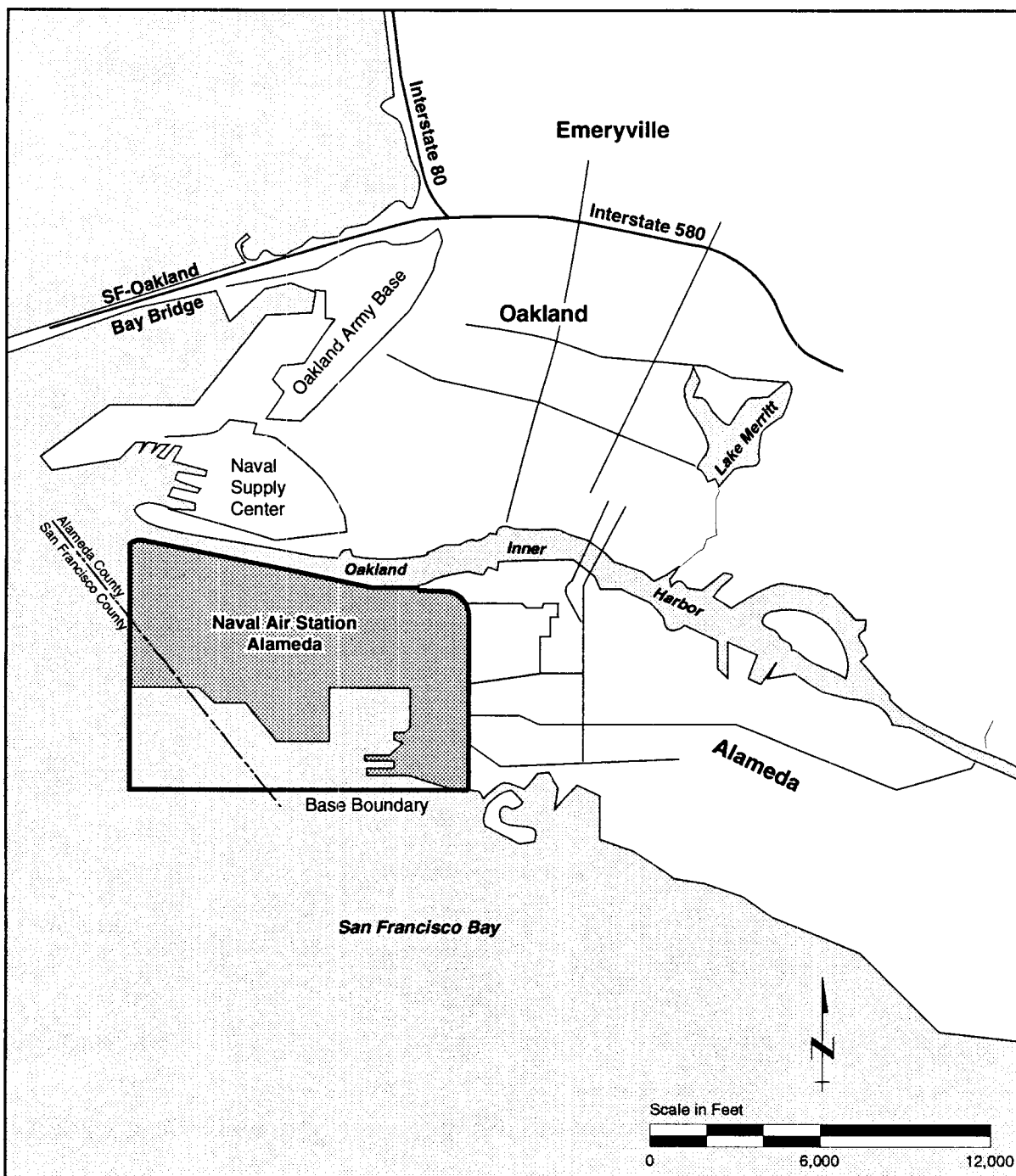
Site 15 is known to contain soil with elevated polychlorinated biphenyl (PCB) concentrations and lead concentrations exceeding the total threshold limit concentration (TTLTC) toxicity criteria for a hazardous waste according to California Code of Regulations Title 22, Section 66261.24. The Navy has determined that a removal action is appropriate at this site based on the following factors established in the Code of Federal Regulations Title 40 Part 300.415 (40 CFR 300.415).

- (i) Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances, pollutants, or contaminants
- (iv) High levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface that may migrate
- (v) Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released

The removal action will focus on reducing the existing risk to human health and the environment by removing surface soils with elevated PCB and lead concentrations. The removal action is consistent with protecting water quality because it will result in removal of a potential source of groundwater contamination. Results of the removal action will be considered in determining final remedies and the long-term use of Site 15.

II. SITE CONDITIONS AND BACKGROUND

NAS Alameda is located at the west end of Alameda Island, in Alameda and San Francisco Counties, California (Figure 1). Alameda Island lies along the eastern side of San Francisco Bay, adjacent to the city of Oakland. The air station occupies 2,634 acres (onshore and offshore) and is approximately 2 miles long and 1 mile wide onshore. Most of the eastern portion of the air station is developed, mainly with offices and industrial facilities; runways, former landfills, and support facilities occupy the western portion of the station. Site 15 at NAS Alameda is located in the northern portion of the air station, north of Perimeter Road and Runway 7-25 and approximately 250 feet south of the



Source: Modified from CA State Automobile Assoc. map, Oakland/Berkeley/Alameda. Copyright 1980, revised 1989.

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NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA

REGIONAL LOCATION MAP OF
NAS ALAMEDA

FIGURE 1

Oakland Inner Harbor (Figure 2). The nearest residential area is located approximately 1.5 miles east from Site 15.

Site 15 consists of Building 283, Building 301, the concrete foundation of former Building 389, and the associated yards of all three buildings (Figure 3). The Navy constructed these quonset huts at Site 15 in the 1950s. Buildings 283 and 301 were used for storage of electrical equipment, oil-filled transformers, and old, unused machinery. Before Building 389 was torn down (the concrete slab is still in place), it stored transformers (Canonie Environmental [Canonie] 1990). During a site visit conducted in March 1988, Canonie personnel noted that several 55-gallon drums of hydraulic fluid were stored in Building 301, and that surface soils around Building 301 were discolored.

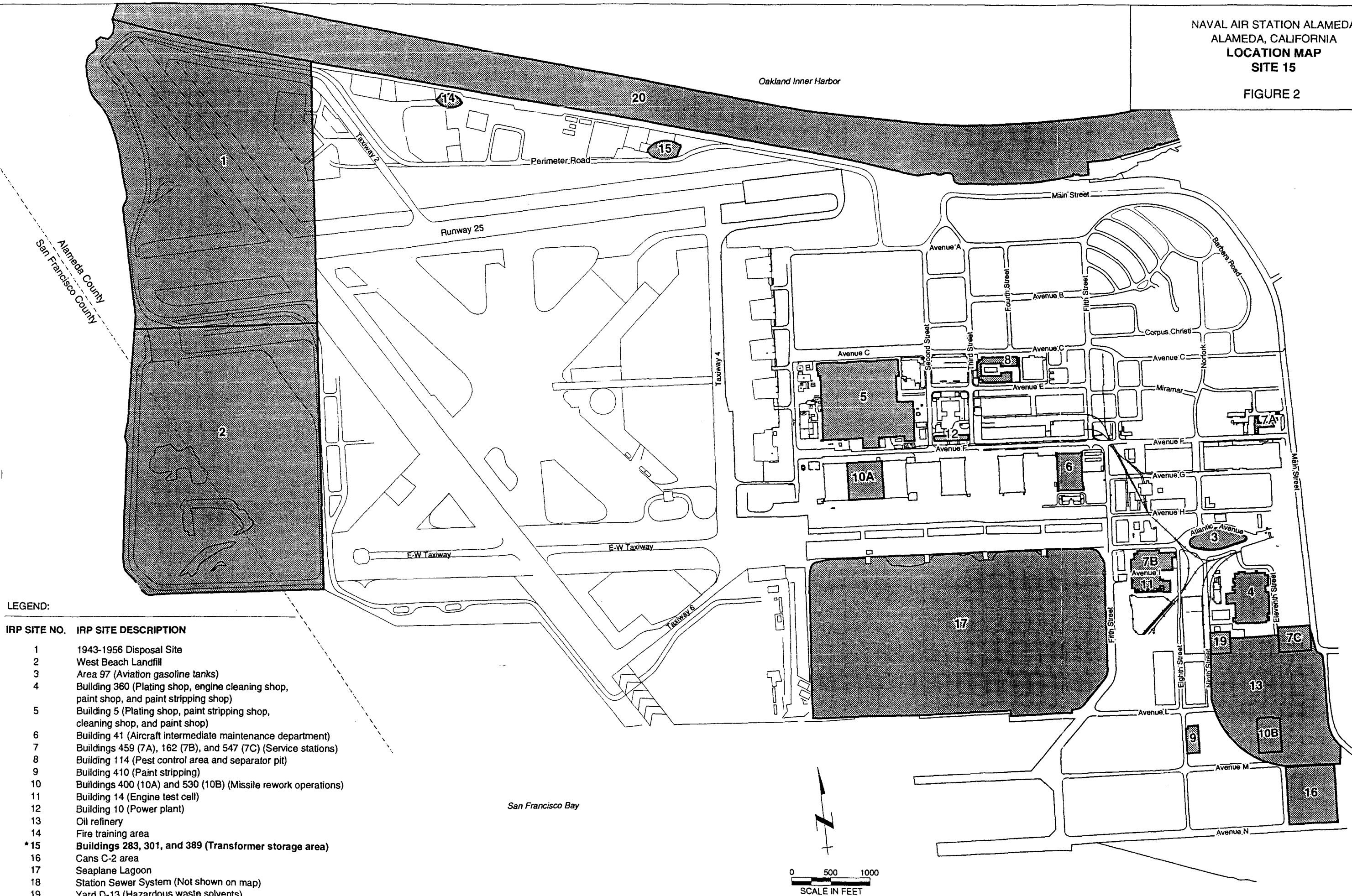
Prior to 1974, transformers were stored on bare ground in the vicinity of Buildings 283, 301, and 389. According to personnel familiar with site operations, an estimated 200 to 400 gallons of oil containing PCBs from transformers may have been stored at any one time. Personnel also recalled occasional leaks of the PCB-containing oil. However, the PCB-containing oil was also drained from the transformers on a regular basis and used to spray the grounds around the nearby buildings for weed control before regulations were promulgated restricting this use (Ecology and Environment, Inc. [E&E] 1983).

The NAS Alameda base fire department currently uses Buildings 283 and 301, located at the southwest corner of Site 15, for storage of equipment. The area around both buildings is fenced. The remainder of the site consists of the foundation of Building 389 and an empty lot, and is used as a storage yard by one of the base maintenance groups. The entire site is enclosed by an approximately 8-foot-high, chain-link fence, with posted signs stating "Warning - PCB Contamination in Surface Soil - Unauthorized Personnel Prohibited".

Soil at Site 15 contains PCBs and lead in surface soils. PCBs have been detected in most surface-soil and soil boring samples from depths ranging from 0.5 feet below ground surface (bgs) to 2 feet bgs. The PCB Aroclor-1260 was detected in 58 of 61 surface samples collected (Figure 4). Concentrations detected in surface samples ranged from 0.14 milligrams per kilogram (mg/kg) to 19 mg/kg. Lead concentrations detected in surface samples ranged from 5 mg/kg to 1,350 mg/kg (Figure 5). At

FIGURE 2

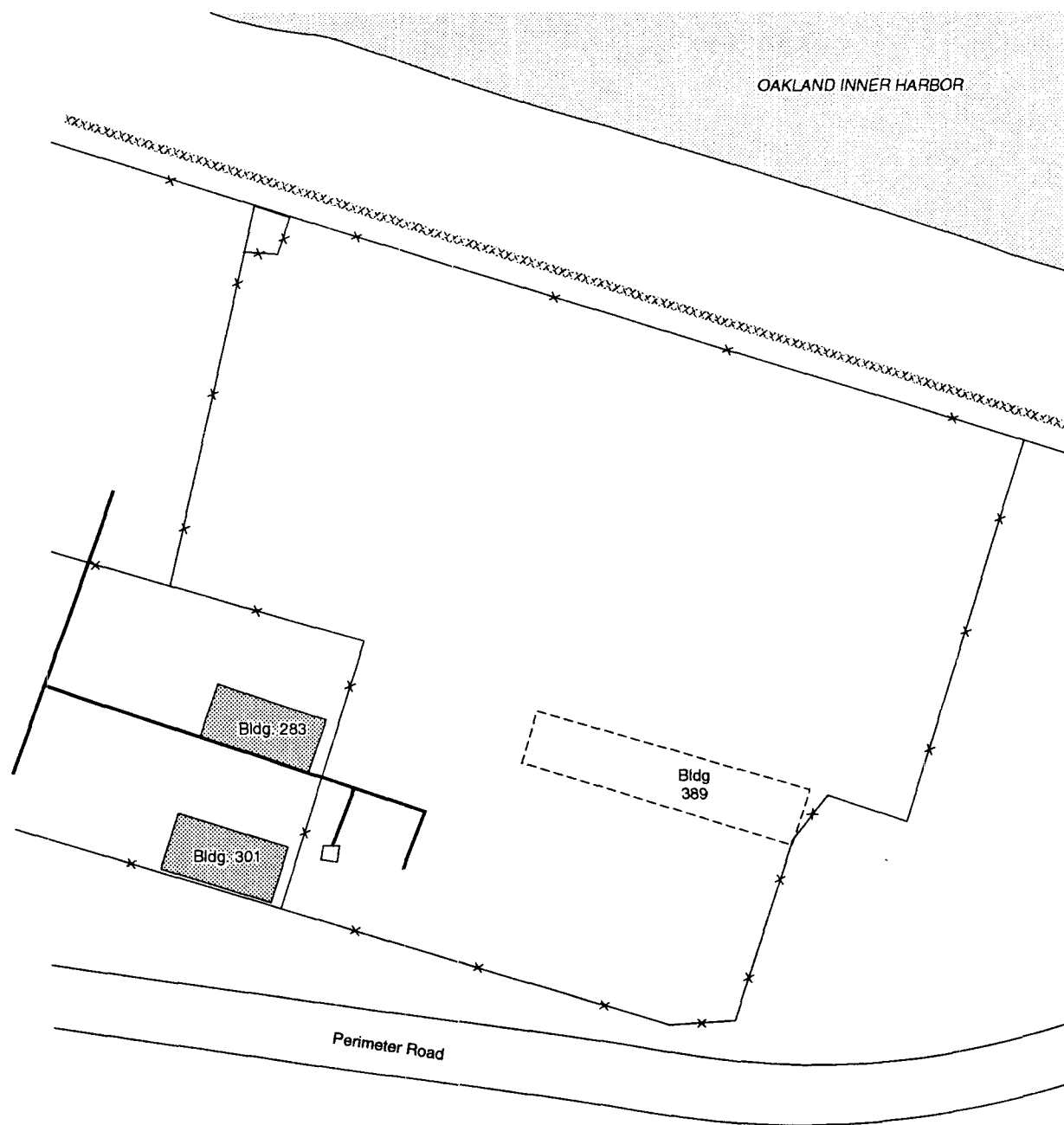
03/94.AL









LEGEND:

IRP SITE NO.	IRP SITE DESCRIPTION
1	1943-1956 Disposal Site
2	West Beach Landfill
3	Area 97 (Aviation gasoline tanks)
4	Building 360 (Plating shop, engine cleaning shop, paint shop, and paint stripping shop)
5	Building 5 (Plating shop, paint stripping shop, cleaning shop, and paint shop)
6	Building 41 (Aircraft intermediate maintenance department)
7	Buildings 459 (7A), 162 (7B), and 547 (7C) (Service stations)
8	Building 114 (Pest control area and separator pit)
9	Building 410 (Paint stripping)
10	Buildings 400 (10A) and 530 (10B) (Missile rework operations)
11	Building 14 (Engine test cell)
12	Building 10 (Power plant)
13	Oil refinery
14	Fire training area
*15	Buildings 283, 301, and 389 (Transformer storage area)
16	Cans C-2 area
17	Seaplane Lagoon
18	Station Sewer System (Not shown on map)
19	Yard D-13 (Hazardous waste solvents)
20	Estuary (Oakland Inner Harbor)

* Site presented in the Engineering Evaluation/Cost Analysis Approval Memorandum



LEGEND:

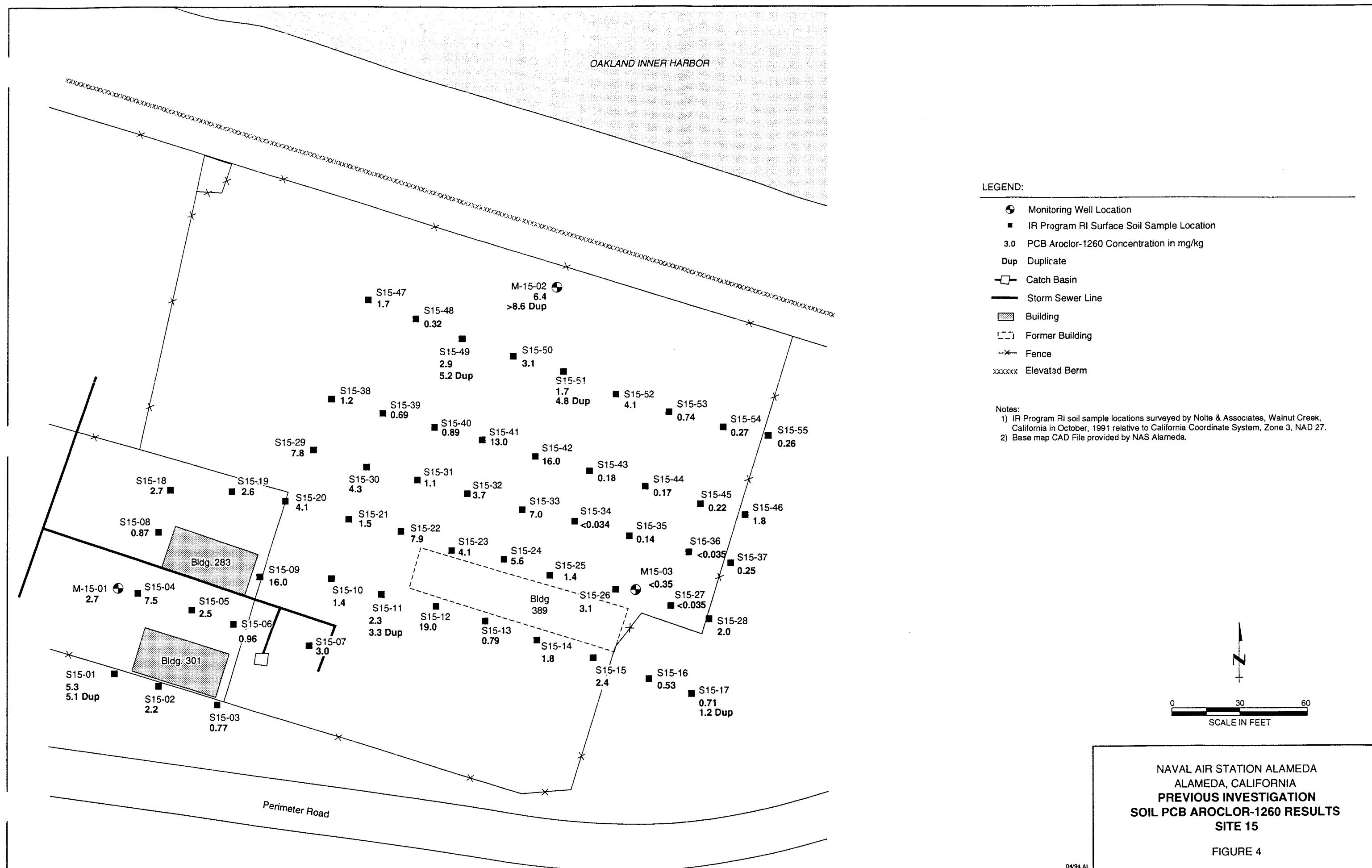
-  Catch Basin
-  Storm Sewer Line
-  Building
-  Former Building
-  Fence
-  Elevated Berm

Notes:
Base map CAD File provided by NAS Alameda

0 30 60
SCALE IN FEET

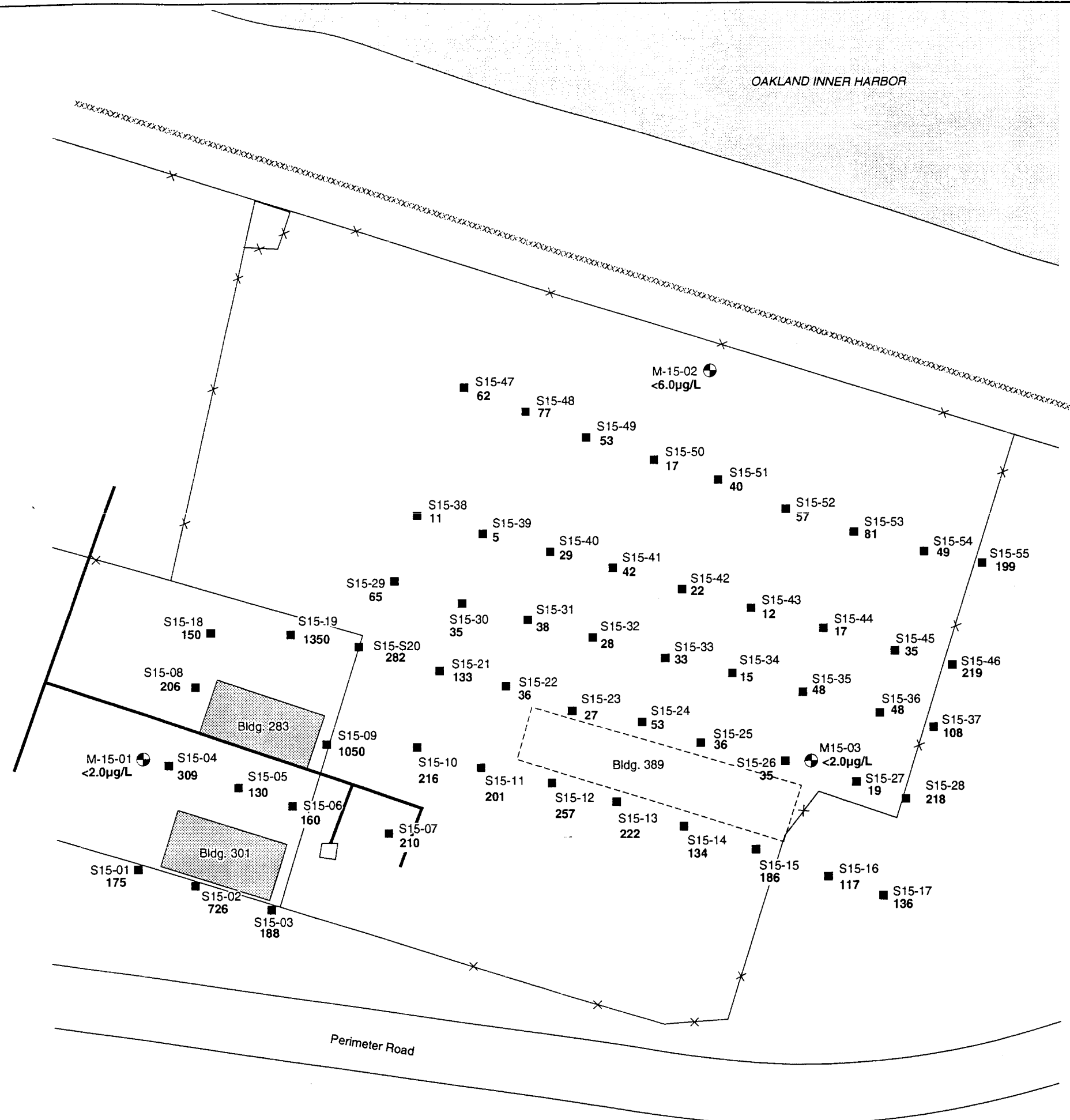
NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
SITE MAP
SITE 15

FIGURE 3



NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
PREVIOUS INVESTIGATION
SOIL PCB AROCLOR-1260 RESULTS
SITE 15

FIGURE 4

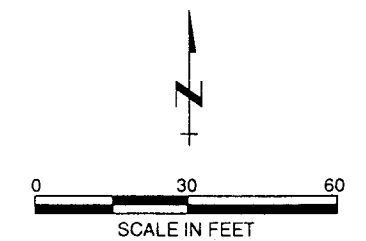


LEGEND:

- Monitoring Well Location
- IR Program RI Surface Soil Sample Location
- 150 Lead Concentration* (mg/kg) (Surface)
* at 2.0 ft. bgs, lead <10 mg/kg
- ☐ Catch Basin
- Storm Sewer Line
- ▨ Building
- ▭ Former Building
- X— Fence
- xxxxxx Elevated Berm

Notes:

- 1) IR Program RI soil sample locations surveyed by Nolte & Associates, Walnut Creek, California in October, 1991 relative to California Coordinate System, Zone 3, NAD 27.
- 2) Base map CAD File provided by NAS Alameda.



NAVAL AIR STATION ALAMEDA
ALAMEDA, CALIFORNIA
PREVIOUS INVESTIGATION
SOIL TOTAL LEAD RESULTS
SITE 15

FIGURE 5

depths greater than or equal to 2 feet bgs, PCBs were not detected, and lead was detected only at concentrations less than 10 mg/kg.

No previous response actions have been taken at Site 15.

III. THREAT TO PUBLIC HEALTH, WELFARE, OR THE ENVIRONMENT

Contaminated surface soil at Site 15 contains elevated PCBs and lead in concentrations exceeding the TTLTC toxicity criteria for a hazardous waste according to California Code of Regulations Title 22, Section 66261.24 (Title 22, § 66261.24). PCBs and lead are hazardous substances as defined in 40 CFR 300.5. PCBs are subject to land disposal restrictions (LDR) under 40 CFR 268.32.

A. THREATS TO PUBLIC HEALTH OR WELFARE

A removal action will reduce the threat of human exposure identified below that results from contaminated soil at Site 15.

- **Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances, pollutants, or contaminants.** Humans working at the site may be exposed to the contaminated soils containing PCBs and lead by direct contact or ingestion of dust. Lead concentrations in soil exceed Department of Toxic Substances Control's (DTSC) default value concentration of 130 mg/kg (DTSC 1994).
- **High levels of hazardous substances or pollutants or contaminants in soils that may migrate.** Infiltrating rainwater may cause lead in soil to migrate to groundwater, which is 2.5 to 5.2 feet bgs (groundwater elevations are influenced by tidal and seasonal fluctuation). PCBs and lead are not likely to be washed with surface runoff into the adjacent Oakland Inner Harbor during rainfall because an elevated berm lies between the site and the harbor.
- **Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released.** Arid weather conditions and high winds may cause PCBs in soil to become airborne on fugitive dust.

B. THREATS TO THE ENVIRONMENT

A removal action will reduce the potential for environmental damage identified below due to contaminated soil at Site 15.

- **Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances, pollutants, or contaminants.** PCBs and lead may enter the food chain through direct contact and ingestion by burrowing animals or plant uptake and subsequent ingestion by wildlife. PCBs and lead are toxic by ingestion and accumulate within animal tissue.

IV. ENDANGERMENT DETERMINATION

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing a removal action, may present an imminent and substantial endangerment to public health or welfare or the environment, based on the evaluation of current threats to public health and the environment.

V. ENFORCEMENT ACTIONS

The United States Environmental Protection Agency (EPA) Region IX, California Environmental Protection Agency (Cal-EPA) DTSC, and the Regional Water Quality Control Board (RWQCB) San Francisco Bay Region are the federal and state support agencies during Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) activities. These agencies review and comment on the Navy's CERCLA response activities at NAS Alameda.

VI. EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT TAKEN

Delayed action at Site 15 will result in continued potential for PCBs to be released into the air and lead to migrate through subsurface soils into the shallow groundwater beneath the site. Humans working at or near the site may be exposed to the contaminated soils containing elevated PCB and lead concentrations by direct contact or ingestion of dust. PCBs and lead may enter the food chain through direct contact and ingestion by burrowing animals or plant uptake and subsequent ingestion

by wildlife. Migration of PCBs and lead into the adjacent Oakland Inner Harbor with surface water is unlikely because an elevated berm exists between the site and the Oakland Inner Harbor.

VII. PROPOSED ACTION AND ESTIMATED COSTS

The Navy has determined that an EE/CA for a removal action is appropriate to select an alternative to reduce risks presented by contaminated surface soil at Site 15. These soils contain elevated levels of PCBs and lead in concentrations exceeding the TTLC toxicity criteria for a hazardous waste according to the California Code of Regulations Title 22 Section 66261.24. The cost for preparing an EE/CA will be approximately \$172,000.

REFERENCES

- Canonie Environmental (Canonie). 1990. "Sampling Plan, Remedial Investigation/Feasibility Study Naval Air Station Alameda, California, Volume I." Prepared for Navy-WESTDIV. February 12.
- Code of Federal Regulations (40 CFR). Office of Federal Register, National Archives and Records Administration. U.S. Government Printing Office.
- Department of Toxic Substances Control (DTSC). 1994. "Preliminary Endangerment Assessment Guidance Manual." State of California Environmental Protection Agency. January.
- Ecology and Environment, Inc. (E&E). 1983. "Initial Assessment of Naval Air Station, Alameda, California." Prepared for Naval Energy and Environmental Support Activity (NEESA), Document Number 13-014. April.